PHASE II
CORRECTIVE MEASURES STUDY REPORT
REFINED METALS CORPORATION
BEECH GROVE, INDIANA
(IND 000 718 130)

Prepared For:
REFINED METALS CORPORATION
3000 Montrose Avenue
Reading, PA 19605

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ADVANCED GEOSERVICES CORP.
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Project No. 2003-1046-06
Original Submission: October 21, 2005
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1.0 INTRODUCTION

1.1 GENERAL

Refined Metals Corporation (RMC) operated a secondary lead smelter in Beech Grove, Indiana (Site) from 1968 through 1995. The facility reclaimed lead from used automotive and industrial batteries and other lead bearing materials. The Site ceased smelting operations on December 31, 1995. During its operating life, the facility handled materials that were classified as hazardous materials or hazardous wastes under the Resource Conservation and Recovery Act (RCRA).

Pursuant to the requirements of RCRA, the facility submitted a Part A RCRA permit application on November 19, 1980. The facility was granted Interim Status as a hazardous waste treatment storage and disposal facility (IND 000 718 130). A Part B permit application was submitted during the mid-1980s; however, the facility closed before full RCRA status was granted.

The Site is now the subject of a Corrective Measures Study (CMS). The CMS is being performed pursuant to the requirements of a Consent Decree negotiated between RMC and the United States Environmental Protection Agency (USEPA) (Civil Action #IP902077C). The oversight from the USEPA applies to all areas of the Site, except the RCRA Subtitle C units that were granted Interim Status in 1980. The Interim Status units are being closed under the regulatory purview of the Indiana Department of Environmental Management (IDEM). The Interim Status units are the indoor and outdoor waste piles and a 750,000-gallon surface impoundment. Although the process for closure of the Interim Status units has not progressed to selection of a closure method, it is expected that the closure of those units will be performed utilizing techniques similar to the alternative(s) selected for the remainder of the Site. It is also expected that the closure activities will occur simultaneously with corrective action. Therefore, the evaluation of alternatives has been completed with the SWMUs included in the CMS process.

1.2 PURPOSE

This Phase II Corrective Measures Study (Phase II CMS) has been prepared in general accordance with the CMS Work Plan approved by the USEPA in a letter dated November 5, 2003. The CMS Work Plan separated the CMS process into two phases. The final version of the Phase I CMS Report was submitted on May 6, 2005 and approved in writing by the USEPA in a letter dated August 23, 2005. The Phase I CMS Report included a Baseline Human Health Risk Assessment (BHHRA) prepared by Gradient Corporation (Cambridge, Massachusetts). The BHHRA evaluated multiple lead and arsenic in soil exposure scenarios for the former manufacturing areas ("on-site areas") and surrounding areas of the Site covered by lawn, brush and woods ("grassy areas"). The BHHRA concluded that under some of the exposure scenarios, an unacceptable risk may exist for lead in soil. Preliminary Remediation Goals (PRG) and Remedial Action Levels (RALs) were calculated for lead in those areas identified as having a potentially unacceptable risk. RMC has agreed to use the PRG and RAL for a Construction Worker scenario ("Worker 2 Scenario") for both the on-site and grassy areas of the Site provided the USEPA will not require further revisions to the BHHRA with regard to the Construction Worker 2 Scenario assumptions, inputs, outputs, conclusions or application of the outputs as indicated in the BHHRA. The USEPA has agreed to application of the PRG and RAL for the Worker 2 scenario under these conditions. Exposure scenarios evaluated as part of the BHHRA for the soils on the Citizens Gas Property and the drainage ditch along the railroad tracks and the drainage ditch along Arlington Avenue did not identify an unacceptable risk in these areas; however, the CMS includes provisions for remediation of soils and sediments in those off-site areas with total lead concentrations above the USEPA residential screening level (400 mg/kg) where public access can occur. Specifically, the CMS proposes remediation of soil and sediment in right-of-ways for Arlington Avenue and Big Four Road, and the railroad right-of-way. Because there is no currently unacceptable risk in these areas, their remediation will be coordinated with on-site remediation of the RMC property. The BHHRA did not include assessing exposure to Site groundwater because the Site and surrounding properties are all serviced by public water supply and no complete exposure pathways were identified for groundwater.

The CMS was completed as an iterative process intended to first identify and screen potential remedial options and then further evaluate selected alternatives through a more detailed analysis. No treatability or pilot studies were performed for this CMS because the technologies selected during the initial screening process have been successfully applied at numerous sites with similar constituents of concern. The ultimate goal of the CMS was to identify corrective measure alternatives that are capable of adequately limiting exposure to lead in soils and sediment to result in acceptable risk levels as determined by the BHHRA. The scope of the CMS process was expanded at the request of USEPA to also include an evaluation of alternatives available to address elevated concentrations of dissolved arsenic and particulate lead in the shallow perched groundwater.

1.3 ORGANIZATION

The CMS Report includes the following elements:

- Background;
- Media Cleanup Standards;
- Identification and Development of Alternatives;
- Evaluation Criteria;
- Evaluation of Alternatives;
- Recommendation for Corrective Measure Alternative; and,
- Project Schedule.

2.0 BACKGROUND

2.1 SITE DESCRIPTION

The Site is located at 3700 South Arlington Avenue in Beech Grove, Indiana (Figure 1). The Site, as shown on Figure 1, covers approximately 24 acres which includes approximately 10 acres within the inner fence where smelting operations were performed ("on-site area"). The remainder of the Site consists of areas of lawn, woods and thick brush ("grassy area") between the inner and outer fences. The on-site area contains several structures. These are identified as the Battery Breaker, Material Storage and Furnace, Refining, Warehouse, Wastewater Treatment/Filter Press, and Office Buildings. Ancillary structures exist including a vehicle maintenance building, baghouses, pump sheds and a concrete and geomembrane lined surface impoundment. Mixtures of industrial/commercial land uses occupy surrounding properties. Currently, the Site is idle except for the wastewater treatment system, which remains in operation to process storm water collected from the on-site areas of the facility. The surface impoundment is still utilized to collect and hold storm water waiting processing through the wastewater treatment system.

2.2 PREVIOUS INVESTIGATIONS

Pursuant to the requirements of the Consent Decree, the Site has been the subject of a RCRA Facility Investigation (RFI). The RFI was completed in two phases. Phase I activities included the utilization of historical information and preliminary sampling to determine the presence, magnitude, extent and mobility of releases on and beneath the Site and adjacent off-site areas. A Closure Investigation was conducted within the limits of the SWMUs concurrently with the RFI.

The Phase II RFI further defined the extent of affected soil and sediment and evaluated impacts to groundwater. RMC also implemented Interim Measures to prevent the off-site migration of affected soil and sediment in a drainage ditch along a former railroad spur that entered the facility from the north. Additional groundwater sampling was also performed in January 2007 to supplement the groundwater portion of the CMS. Soil samples were collected concurrently with the January 2007 groundwater sampling to supplement the Closure Investigation.

The total lead and arsenic results for soil and sediment samples collected during the RFI and Closure Investigation are provided in tabular format in Table 1. The sample locations are shown on Drawing 1, 2, 3 and 4. Data validation reports and additional groundwater sampling data for the January 2007 soil and groundwater sampling are provided in Appendix B.

Groundwater conditions have been evaluated through the installation and sampling of twelve (12) shallow and two (2) deep monitoring wells. Monitoring well locations are shown on Figure 2. Groundwater in the shallow zone of saturation near the former manufacturing area occurs as perched zones within thin, laterally discontinuous layers of sand and sandy silts contained in clayey-silt and silty-clay glacial deposits. The monitoring wells identified as "deep" are screened within a middle perched zone located 75 to 85 feet below ground surface. "Depth to water" measurements indicate that the potentiometric surface of the middle perched zone is on the order of 14 to 17 feet below ground surface with a downward gradient from the shallow to the middle perched zone of 6 to 10 feet.

The results of groundwater sampling conducted as part of the RFI, Closure Investigation and CMS are provided in Tabular format on Tables 2A through 2N. A groundwater contour map is provided for the most recent (January 2007) sampling event on Figure 2. Total results from the January 2007 groundwater sampling event for lead and arsenic in the shallow groundwater wells are also presented on Figure 2.

A review of shallow groundwater sample results, obtained as part of the RFI and Closure activities (Tables 2A through 2N), shows that the current MCL for arsenic (10 ug/L) has been exceeded on more than one occasion at groundwater monitoring wells MW-1, MW-2, MW-3, MW-7, MW-8 and MW-10. The 15 ug/L MCL standard for lead is exceeded in unfiltered samples on more than one occasion in MW-2, MW-7 and MW-8. With the exception of MW-3, each of the wells that exceeds the MCL (arsenic) or USEPA drinking water standard (lead) is located within or immediately adjacent to an area of the Site identified to contain the most deeply impacted soils.

MW-3 has had two total arsenic results at 11 ug/L, one total arsenic result at 28 ug/L and a result of 170 ug/L. The available filtered results for MW-3 have all been below 10 ug/L and field logs from the sampling event corresponding to the 170 ug/L (January 2007) result indicate that the turbidity of the sample was so high that the turbidity probe indicated an erroneous reading. Field parameters for all wells are also provided in Tables 2A through 2N. Recognizing that MW-3 was constructed in 1990, that the site soils have a naturally high arsenic content and that MW-3 is located in an area of the Site not associated with the recycling and smelting operations, the arsenic exceedances observed in MW-3 are believed to be a reflection of turbidity in the well and not water quality. If future sampling of MW-3 is necessary, it is advised that the well be redeveloped and video inspected to evaluate the integrity or replaced.

The average observed lead concentration in the top 24 inches of the borings conducted in the former waste pile areas adjacent to MW-2S, MW-7 and MW-8 (CSB-1, 1A, 2, 3, 4, 5, 6, 7, 10, 10A, 11, 12 and 15, and RSB-12, 52 and 53) is 42,776 mg/kg. The average observed arsenic concentration in the top 24 inches of soil in this same area is 254.2 mg/kg. MW-10 is situated immediately (approximately 60 feet) north of the outdoor waste pile area and the average lead and arsenic concentrations for boring RSB-9, located adjacent to MW-10 are 9,150 mg/kg and 61.5 mg/kg. In the vicinity of MW-1, the average observed surficial (<24-inches) lead and arsenic concentrations (borings RSB-54, 55 and 57) are 24,483 mg/kg and 207.5 mg/kg respectively. Based on the knowledge that the outdoor waste pile areas contained lead-acid battery feed material, it can be concluded that acidic water moving through the waste and the high concentration soils is the likely cause of the elevated groundwater concentrations observed in MW-2, MW-7, MW-8 and given the proximity to the outdoor waste pile area, even MW-10. Although the area of MW-1 was not identified as an outdoor waste pile, it appears the surficial arsenic (207.5 mg/kg) concentration, even in the absence of the absence of acid water infiltrating into the soil was sufficiently high to elevate arsenic in the groundwater, although the elevated lead concentrations, even at 24,483 mg/kg, did not significantly impact lead in groundwater concentrations at this location.

It should be noted that the perched groundwater (shallow or deep) is not used for potable water at the Site or in the general vicinity of the Site. Also, prior to January 23, 2006, the MCL for Arsenic in groundwater was 50 ug/L and only three groundwater sample result from all the shallow perched groundwater samples collected on-site exceeded that level (MW-3 on January 24, 2007 and MW-7on October 27, 2003 and January 25, 2007). On January 23, 2006 the level was reduced to 10 ug/L and relative to that new value, 31 sample results exceeded the standard. For the reasons cited above, groundwater had not been subjected to the CMS process; however as requested by USEPA in their comment letter dated November 30, 2006, RMC has now completed a groundwater CMS, the results of which are included herein.

3.0 MEDIA CLEANUP STANDARDS

3.1 DETERMINATION OF MEDIA CLEANUP STANDARDS

The RFI and Closure investigation identified total concentrations of lead and arsenic in soil that were above the USEPA's risk based screening thresholds and therefore could potentially pose an unacceptable risk to human health. As a result, the initial activity of the CMS process was the completion of a Baseline Human Health Risk Assessment (BHHRA) to determine the site-specific concentrations for lead and arsenic in soil that could represent a threat to human health. Because groundwater from the shallow or middle perched zones is not used, public water services the Site and surrounding area, and because no complete exposure pathways for groundwater exist, the BHHRA did not include exposure to site groundwater.

3.2 SITE SPECIFIC RISK ASSESSMENT

The site specific Baseline Human Health Risk Assessment (BHHRA), contained in the Phase I Corrective Measures Study Report (May 6, 2005) and provided in the Phase II CMS Report as Appendix A, determined that an unacceptable risk to human health might exist for lead in soil under certain exposure scenarios in the on-site and grassy areas. Exposure scenarios evaluated for the soils on the Citizens Gas Property and the drainage ditch along the railroad tracks and the drainage ditch along Arlington Avenue determined that an unacceptable risk does not exist in these areas based on current use. As detailed in the BHHRA, site specific Preliminary Remediation Goals (PRGs) were developed for each of those exposure scenarios where a potentially unacceptable risk might exist. The PRG represents the average allowable soil lead concentration for the exposure scenario evaluated. To achieve the PRG, remedial measures are required in those areas of the Site that contain the highest soil lead concentrations. As those areas are eliminated (i.e., removed and replaced with clean (<50 mg/kg total lead) soil), the average soil lead concentration for the exposure area is recalculated. This process is repeated until the average soil lead concentrations are below the PRG. The highest remaining soil lead concentration in the exposure area represents the Remedial Action Level (RAL). The RAL therefore represents the concentration above which soil removal is necessary to achieve the PRG.

3.3 MEDIA CLEANUP STANDARDS

3.3.1 Soil

Based on the results of the site specific BHHRA, the Preliminary Remediation Goal (PRG) and Remedial Action Level (RAL) for lead in soil are as follows:

	ON-SITE*	GRASSY AREA*
PRG	920	920
RAL	8,470	4,954

* All values reported in mg/kg.

Based on the results of the BHHRA, and as documented in the USEPA approval letter for the BHHRA, arsenic levels remaining in soil after remediation for lead will be acceptable. No remedial activity is required for off-site areas as the BHHRA concluded that exposure by current receptors does not pose an unacceptable risk; however, because access to areas along the right-of-ways for Arlington Avenue, the railroad right-of-way and Big Four Road can not be controlled, off-site soil and sediment areas with total lead concentrations greater than the USEPA residential screening level (400 mg/kg) in these areas will be removed. The Citizens Gas property is not proposed for remediation because access to the area is already restricted by a security fence and because conversations with the City of Beech Grove have indicated that the Citizens Gas property is considered part of a larger commercial/industrial zoning area. Although not expected to be a problem, if one of the right-of-ways can not be remediated concurrently with the RMC Site, a well defined deed restriction will be recorded for the property that indicates that any future development or reuse of the property must be supported by the exposure scenarios evaluated in the BHHRA or the BHHRA must be rerun for the future proposed exposure conditions and cleaned to the appropriate levels. The deed restriction could be removed if Refined or the current or future landowner remediates the property to the USEPA residential screening level.

3.3.2 Groundwater

For the purposes of the CMS, RMC will utilize the USEPA's MCL for arsenic of 10ug/L for both residential and Industrial and groundwater standard for lead of 15 ug/L for initial screening, as well as the IDEM Industrial lead in groundwater default value of 42 ug/L. While the 10 ug/L arsenic and 15 ug/L lead coincide with the IDEM residential default RISC criteria for potable water, it should be recognized that neither the shallow or intermediate perched zones are utilized for water supply (potable or otherwise) at the RMC facility or surrounding properties. Consideration of the IDEM Industrial lead in groundwater level is warranted given the fact that the allowable soil concentrations selected in the BHHRA have already established that future use of the Site will be restricted to non-residential landuse.

Site specific SPLP testing (EPA Method 1312) on select soil samples during the January 2007 soil sampling have resulted in average partitioning coefficients for lead and arsenic of 6901 L/kg and 3,917 L/kg, respectively. The samples analyzed for leaching in January 2007 all had lead concentrations well below the proposed PRG established in the BHHRA. To provide leaching values for a range of soil lead concentrations more representative of those soils that will remain in-place after soil remediation, RMC will be collecting additional soil samples in late August or early September 2007 for additional testing. Those results will be provided to USEPA following completion of testing and validation.

4.0 IDENTIFICATION AND DEVELOPMENT OF ALTERNATIVES

The objective of this section is to list, describe and preliminarily screen potential remedial technologies for impacted soils and sediments, and groundwater. The soil and sediment includes the "on-site" and "grassy" areas at the Site and the off-site properties that must either be remediated or deed restrictred. The groundwater evaluates the shallow perched groundwater. The following remedial technologies were considered for remediation at the Site. Where a particular technology is obviously inappropriate and not suitable for further retention, a basis for such a determination is also provided:

4.1 SOIL AND SEDIMENTS

4.1.1 No Action (Alternative 1)

No Action is a General Response Action, which does not have any specific technologies or process options. The No Action General Response Action does not include any additional remedial responses for the Site. It was retained to provide a baseline to compare the relative benefits of the other options.

4.1.2 Excavation (Alternative 2)

On-site soils above the RAL and off-site soils above the USEPA residential screening level will be excavated and the resulting area backfilled or re-graded to promote surface water drainage. The amount of excavation required will be dictated by the results of previous soil sampling. Alternative 2 must be implemented in conjunction with an On-Site Containment Cell (Alternatives 3A or 3B), and/or Stabilization (if necessary) and Off-Site Disposal (Alternative 4).

4.1.3 On-Site Containment Cell (Alternatives 3A and 3B)

Capping is a remedial technology typically chosen as a source control action because it can effectively isolate impacted soil, reduce infiltration, prevent direct exposure, and is adaptable to various Site conditions. Remediated soil would be consolidated into a single location and capped. Concrete and non-degradable rubble generated as part of the demolition activities can also be placed in the cell if adequate air-space exists. A wide range of readily available materials can be used to construct the cap. For this CMS, the selected cap alternatives would be one of the following:

1) Alternative 3A - Composite Cover consisting of (from top to bottom) vegetative cover, 6" topsoil, 18" cover soil, geocomposite drainage layer and HDPE geomembrane.

2) Alternative 3B - Bituminous Asphalt Cover consisting of (from top to bottom) bituminous concrete pavement a geotextile filter fabric and a crushed aggregate subgrade.

4.1.4 Stabilization and Off-Site Disposal (Alternative 4)

This alternative involves sending excavated soils to an off-site disposal facility. Depending on the results of characterization analysis for the excavated soil, treatment may also be required. The evaluation has been completed based on the assumption that excavated soils will be stabilized on-site and disposed off-site at a non-hazardous landfill.

4.1.5 Resource Recovery and Recycling (Alternative 5)

Resource recovery and recycling is listed in the CMS Work Plan as an alternative retained for evaluation and screening during the Phase 2 CMS activities. A general description of the concept is that the remediated soils would have sufficiently high concentrations of lead such that the soils could be processed through a secondary lead smelter for the purpose of recovering the lead. Based on discussions with secondary lead smelter personnel, the concentrations that would be conducive to resource recovery and recycling would be in excess of 100,000 mg/kg (i.e., 10% lead) and preferably greater than 250,000 mg/kg.

None of the soil samples collected as part of the RFI was above 100,000 mg/kg. Only 10 of the soil borings conducted as part of the closure investigation for the Solid Waste Management Units encountered one or more samples with lead concentrations greater than 100,000 mg/kg. These are generally situated within the footprint of the former outdoor waste piles and are estimated to represent less than five (5%) of the total amount of material requiring remediation. Therefore, the Resource Recovery and Recycling option (Alternative 5) is not retained for further evaluation in this CMS as a Site wide alternative. Although not suitable for site wide application, resource recovery and recycling may still be considered as a possible disposal alternative for specific solid waste streams generated during corrective action with very high lead concentrations. The solid waste stream in question must also be accepted by a secondary lead smelter.

4.1.6 In-Situ Stabilization (Alternative 6)

Stabilization involves a physical or chemical reduction of the mobility of hazardous constituents. Immobilization typically provides a significant decrease in leachability and the potential for contaminant migration. Immobilization is accomplished through physical (i.e., microencapsulation) and chemical (i.e., pH control, changes in chemical species) processes. Physical processes involve the entrapment of contaminants within a solid matrix, thus, reducing contaminant mobility by decreasing the permeability of the contaminated material. Chemical processes reduce contaminant mobility by various means such as converting the contaminant to a less mobile form or adjusting the pH of materials to reduce their solubility. Stabilization would not change the mass of contaminants present at the Site.

Stabilization can be addressed via ex-situ, as discussed in Section 4.4, or in-situ processes. Surface soil mixing allows for mixing without removal of treated materials. Shallow (8 to 12 inch) lifts of contaminated soil can be stabilized using modified construction equipment such as bulldozers. Excavators and caisson drilling rigs can be modified to deliver stabilization reagents to depths greater than 100 feet (as reported by various vendors). The degree of mixing varies with each of these technologies.

While in-situ stabilization decreases the mobility of the contaminants, it does not decrease the volume or toxicity of the contaminants. Additional measures would be required to prevent direct contact for protection of human health. In-situ stabilization is not a widely-accepted technology and has not been implemented full-scale for remediation of lead-contaminated soil, primarily due to the effort involved in application of reagents and the uncertainty in mixing thoroughness. When it is used it is on large, open sites with sufficiently large volumes of waste to justify the mobilization of specialized equipment and development and implementation of monitoring and testing protocol. Quality control could only be conducted through extensive investigation such as test pits or borings.

For the reasons cited above, the In-Situ Stabilization option (Alternative 6) is not retained for further evaluation in this CMS as a Site wide alternative.

4.1.7 Soil Washing (Alternative 7)

Soil washing technology consists of two primary processes: 1) use of a liquid wash solution to physically separate the large grain-size fraction (i.e., battery casings, gravel and sand) from the small grain-size portion (fines fraction, i.e., clay/silt particles); and 2) use of a chemical extraction agent to solubilize (dissolve) contaminants of concern (i.e., soil leaching), thereby providing higher contaminant removal efficiencies from the large grain-size (coarse) material and/or separating the contaminants from the fines fraction. The goal of treatment is to concentrate contaminants to the fines fraction of the material since most organic and inorganic contaminants tend to bind, either chemically or physically, to the clay/silt particles, and/or organic matter within the soil matrix. The large grain-size (coarse) fraction (i.e., sand, gravel, battery casings) is 'cleaned', and there is a reduction in the volume of contaminated material but not the mass of the contaminant (lead).

The washing process typically involves the physical separation of contaminated material utilizing mineral processing equipment and techniques. Acids, caustics, and surfactants may be added to the process in an attempt to enhance contaminant removal by leaching. Chemicals which have been attempted by various parties for soil lead leaching include ethylenediamine tetraacetic acid (EDTA, a chelation agent which complexes lead and increases solubility) and nitric acid. Surfactants are commonly used to remove organic contaminants from soil.

End products of the soil washing process include plastic casings, ebonite casings, washed soil (coarse-grained fraction), and the lead product (fine-grained soil fraction), all of which are solid fractions.

All of the solid end products would theoretically be clean (i.e., below RALs), except the lead product which have high lead concentrations. Generally finer soil particles with high concentrations of lead could be sent to a secondary lead smelter for recovery or stabilized via ex-situ methods and landfilled. The other three end products which no longer contain high concentrations of lead (i.e., coarse soil and battery casings) could conceptually be used for clean fill, fuel supplements or alternatively landfilled. The washing solution would likely be treated and recycled as much as practicable until the end of the project. Treatment most likely would involve filtration and/or precipitation to remove lead.

Soil washing is not a widely-accepted alternative and has not been implemented on full-scale projects. The number of vendors who have successfully completed full-scale projects is very limited as the technology is innovative. Due to the large variation in materials to be treated on-site and the fine material (i.e., silt and clay) in the soil, implementation of soil washing would be difficult. Bench-scale studies for similar projects have not proven to be successful in treating the coarse soil fraction to below TCLP limits for lead. Debris such as battery casing fragments are anticipated to be more difficult to clean because of their irregular size and shape of the casings results in hard to clean corners and cracks in which lead may reside. The intricate nature of this technology inherently requires high maintenance and frequent process modifications. Many of the additives used have hazardous characteristics themselves (i.e., acids and bases) and may require special handling and spill prevention/response plans. Implementation of this technology may require designing and fabricating a site-specific treatment plant. For these reasons, the Soil Washing option (Alternative 7) is not retained for further evaluation in this CMS as a Site wide alternative.

4.1.8 Phytoremediation (Alternative 8)

Phytoremediation is an emerging technology which involves the use of trees and plants to aid in the remediation of soils and/or groundwater. Plants used for remediation of heavy metals include alyssum, hybrid poplars, Indian mustard, pennycress and sunflower. Phytoremediation of metals occurs through several processes including: Phytoextraction and Phytostabilization. Phytoextraction is the uptake of a contaminant by plant roots and translocation of that contaminant into the aboveground portion of the plants. The contaminant is removed by harvesting the plants. Phytostabilization is the immobilization of a contaminant through absorption and accumulation by roots, adsorption onto roots, or precipitation within the root zone of plants.

Phytoremediation is an innovative technology which may be effective in remediation of shallow (less than 1 ft below ground surface without repeated tilling and only as deep as 2 feet with such measures) soils. It requires wide-open areas that are not covered with impervious surface such as buildings and pavement. Obviously, the majority of the proposed remediation area is impervious and some of the proposed excavations are projected to be greater than 2 feet deep and as much as 4.25 feet deep; therefore, phytoremediation would not be conducive to remediation of those areas. The time required for implementation of phytoremediation is lengthy as plants and trees grow at a limited rate. As phytoremediation is not conducive to the proposed excavations and schedule, and as the technology is innovative and not widely applied, the Phytoremediation option (Alternative 8) is not retained for further evaluation in this CMS as a Site wide alternative.

4.2 GROUNDWATER

Shallow groundwater in select monitoring wells at the RMC facility has had exceedances of the MCL for arsenic and residential groundwater standard for lead. Lead results have shown all results for filtered samples at or below 15 ug/L and 13 samples with unfiltered results above 15 ug/L. Those unfiltered results that exceeded 15 ug/L total lead have all been detected in either MW-2, MW-7 or MW-8 all of which are located in the vicinity of the former outdoor waste piles. MW-1, MW-2, MW-7, MW-8 and MW-10 have had filtered and unfiltered arsenic results at or above 10 ug/L. Arsenic has also been detected in unfiltered samples above 10 ug/L in MW-3 in the presence high turbidity but the filtered results have all been below 10 ug/L and as mentioned above, it is recommended that MW-3 be inspected and redeveloped or replaced.

Conclusions have been made that the elevated concentrations observed in the shallow groundwater are likely the result of having very high levels of lead and arsenic in conjunction with, or in close proximity to, acidic water infiltrating from the former waste piles into the subsurface.

4.2.1 No Action (Alternative 1)

No Action is a General Response Action, which does not have any specific technologies or process options. The No Action General Response Action does not include any additional remedial responses for the Site. It was retained to provide a baseline to compare the relative benefits of the other options.

4.2.2 Institutional Controls (Alternative 2)

Institutional controls would place limitations on the use of groundwater at the Site to prevent consumption by human receptors. The institutional controls would be applied in the form of deed restrictions that would prevent the installation and development of potable groundwater wells in the perched groundwater. The deed restrictions would apply to current and future property owners. Institutional controls are retained for further evaluation.

4.2.3 Source Removal (Alternative 3)

Source Removal would consist of remediating soils with lead and arsenic concentrations that may be causing an unacceptable impact from soil to groundwater. Available sampling data indicates that groundwater wells which exhibit concentrations of lead and arsenic above the MCL (arsenic) and USEPA screening level (lead) coincide with areas of the highest total arsenic and lead concentrations in soil and are also being considered for remediation to address soil contamination. Source removal is retained for further evaluation.

4.2.4 Monitored Natural Attenuation (MNA) (Alternative 4)

The term "Monitored Natural Attenuation" refers to natural processes that may occur in groundwater, under a carefully monitored environment, that reduce the mass, toxicity, mobility, concentration and/or volume of contaminants in the media. Natural attenuation processes include a variety of physical, chemical or biological processes that, under favorable conditions, act without human intervention. Relative to arsenic and lead, natural attenuation does not reduce the mass present, but under certain conditions can reduce the toxicity, mobility and concentration present in groundwater. The natural process is typically the reduction of sulfates to sulfides and co-precipitation of metals, or the sorption of dissolved metals on oxyhydroxides, clay minerals, carbonates, solid organic matter and other solids. Based on groundwater chemistry, although sulfate is present in groundwater no sulfide was detected indicating that sulfate reduction is not naturally occurring. Elevated levels of iron and calcium present in the groundwater favor the sorption mechanism of MNA. In addition, the lead and arsenic in groundwater do not appear to have moved downgradient from the soils areas with the highest concentrations and the former site operations area that represent the source areas which indicates that MNA is already occurring. Therefore, MNA is retained for further evaluation.

4.2.5 Permeable Reactive Barrier (PRB) (Alternative 5)

A permeable reactive barrier (PRB) is a passive (no pumping), in-situ option which allows groundwater to pass through a porous media containing a catalyst/formulation. Relative to arsenic, the catalyst is typically an iron or manganese coated sand. Dissolved arsenic adsorbs to hydroxides of iron to form insoluble precipitates. The PRB is placed downgradient of the source and is of sufficient length and depth to intercept the impacted groundwater or constructed in conjunction with impermeable barriers to "funnel" groundwater flow through the PRB. Since the arsenic and lead plumes do not appear to be moving laterally, a PRB is not feasible and is not retained for further evaluation.

4.2.6 Containment (Alternative 6)

Groundwater containment is used to control or limit the lateral flow of groundwater in a finite area or region. Containment can be accomplished by utilizing a low permeability soil-bentonite barrier walls constructed around the area of impacted groundwater. The low permeability walls are typically used in conjunction with a low permeability cap and/or groundwater extraction and/or PRB to control groundwater levels. The walls are well suited for locations where the groundwater to be contained is situated at depths less than 50 feet and a continuous well defined clay or other low permeability layer is present to provide bottom containment. However, since the arsenic and lead plumes do not appear to be moving laterally, a containment wall is not feasible and is not retained for further evaluation.

4.2.7 Groundwater Extraction and Treatment (Alternative 7)

As the name implies, groundwater extraction and treatment would entail the removal of impacted groundwater using wells or extraction trenches and treatment through an ex-situ treatment system prior to discharge through a permitted NPDES discharge point, re-injection, or discharge to the POTW. Extraction and treatment can be effective at reducing mobility and effectively reduces the mass and toxicity of the contaminants in groundwater. Extraction and treatment systems can be expensive to design, install and operate, especially in systems that utilize significant amounts of chemical addition and or reactive media to effect treatment. Groundwater extraction and treatment should be retained for further consideration.

5.0 EVALUATION CRITERIA

Corrective measure alternatives were evaluated based on technical, environmental, human health and institutional concerns as well as cost. A brief discussion of each consideration is provided below.

5.1 TECHNICAL

Technical considerations evaluated for each corrective measure alternative are performance, reliability, implementability and safety. Performance represents the ability of the alternative to achieve the intended function. Site or waste-specific characteristics that could diminish the effectiveness of each alternative were considered. The effectiveness of each alternative was also evaluated based on the anticipated useful life of all components integral to the alternative.

The reliability of each alternative was evaluated based on the operation and maintenance (O&M) requirements as well as the track record of the alternative. O&M requirements including the complexity and required scheduled maintenance were considered. The successful use of the alternative in similar circumstances and the ability to combine the remedy with other alternatives were also considered.

The implementability of each alternative was evaluated based on the difficulty of installation and the time required to install and obtain the desired results from the alternative. Installation considerations included required permits, underground utilities, depth to groundwater, equipment availability and the location of suitable off-site treatment or disposal facilities.

Safety factors evaluated for each alternative included the threat posed to nearby communities, the environment, and workers during implementation. Factors considered included fire, explosion and exposure to hazardous substances.

5.2 ENVIRONMENTAL

Each alternative was assessed to determine short and long term beneficial and adverse effects on the environment. Considerations included the impact on habitat types as well as plant and animal receptors located in, adjacent to, or affected by the facility. Potential impacts to receptors were evaluated on both an individual and biological community level. Each alternative evaluation included proposed methods to mitigate identified adverse impacts.

5.3 HUMAN HEALTH

Each alternative was assessed for mitigation of short and long term exposure to residual contamination as well as the degree to which human health would be protected during and after implementation. The evaluation of each alternative characterized the on-site concentrations of contaminants and describes potential exposure routes to receptors. The predicted changes in exposure over time was also evaluated. This section reviews the reduction in toxicity, mobility or volume of waste.

5.4 INSTITUTIONAL

Each alternative was assessed to determine how Federal, State and local environmental or public health regulations may impact the design, operation, or timing of the alternative.

5.5 IMPLEMENTATION COST

A cost estimate for each alternative was prepared that considers capital expenditures as well as operation and maintenance costs. Capital expenditures include both direct and indirect costs. Direct capital costs include material and labor used in construction and equipment and services used in the treatment of affected media. Indirect capital costs include engineering expenses, licensing and permit costs, start up and shake down costs, and a contingency allowance or unforeseen circumstances.

Operation and maintenance costs include post construction costs necessary to ensure the continued effectiveness of the corrective measure. These costs include operating labor costs; repairs and scheduled maintenance; supplies and utilities; subcontractor services; disposal and treatment costs of generated wastes; and a reserve or contingency fund.

6.0 EVALUATION OF ALTERNATIVES

The potential corrective measure alternatives for soil and sediment described in Section 4.1 were retained for further evaluation, except for Alternative 5 "Resource Recovery and Recycling", Alternative 6 "In-situ Stabilization", Alternative 7 "Soil Washing", and Alternative 8 "Phytoremediation." The potential corrective measures for groundwater described in Section 4.2 were retained for further evaluation except for Alternative 5 “Permeable Reactive Barriers”, and Alternative 6 “Containment.” The rationale for excluding particular alternatives is provided in Section 4. An analysis of the retained corrective measure alternatives based on the criteria described in Section 5.0 is presented in the following section.

6.1 SOIL AND SEDIMENT

6.1.1 Alternative 1: No Action

Technical Considerations

The No Action alternative does not involve any corrective action measures for which technical considerations can be evaluated. As a result, the technical considerations (performance, reliability, implementability and safety) for Alternative 1 are not applicable. Alternative 1 does not reduce the mobility or volume of contaminants at the Site. Alternative 1 does not control the source of releases to reduce or eliminate further releases.

Environmental Considerations

Habitat types, biological communities, and plant and animal receptors at, or in the immediate vicinity of, the Site are very limited as most of the Site is either covered with buildings and/or paved, or is landscaped lawn area. Storm water runoff from the "on-site" areas is collected and processed through the onsite wastewater treatment system and discharged to the POTW. Storm water runoff from the "grassy" areas of the Site enters the grass lined swales toward the south and east or enters the drainage ditch along the former railroad spur at the north end of the Site and discharges to offsite surface water features without treatment.

Where habitats, biological communities, plants, and/or animals may be present, those areas are small, discontinuous and characterized by scrub growth, brush and weeds. These areas have been significantly impacted by previous farming, construction of the adjacent roads and railroads, and development on and around the Site. These previous activities and the current landuse patterns in the area severely limit ecological conditions at the Site. It is judged to be an isolated low functioning eco-system incapable of supporting any significant numbers of wildlife. The portions of those areas that exceed the RALs established for the Site collectively represent less than 0.75 acres. The primary short and long term benefit of Alternative 1 is the avoidance of disturbing what minimal habitats, biological communities, plants, and animals may be present at the Site in areas which exceed RALs. Given the minimal habitat, plant, and animal receptors present at the Site, it is likely that adverse effects on the environment (excluding human exposure) would be minimal for Alternative 1. Although the potential for sediment to be eroded and transported from the Site is generally low at the present time, if the areas of high soil lead and arsenic concentrations are disturbed, off-site transport of sediment could occur. Management of the potential for disturbance and transportation of sediment can be achieved through institutional controls that prevent disturbance and maintenance of the controls installed as interim measures for the Site.

Human Health Considerations

Alternative 1 does not meaningfully change lead and arsenic concentrations in the short or long term or reduce the toxicity, mobility or volume of lead and arsenic impacted soil and sediment. The existing exposure pathways (inhalation and dermal contact) would remain unchanged. Risks presented by the current conditions are evaluated in the BHHRA which was included in the Phase I CMS Report and is provided as Appendix A to this report. Therefore except to the extent that Institutional Controls are effective, the potential for unacceptable risk by human exposure on the Site would remain.

Institutional Considerations

As documented in the Consent Decree and documents prepared to fulfill the requirements of the Consent Decree, the USEPA and IDEM have already asserted that Federal and State regulations do not allow for all impacted soils and sediments to remain at the Site without some type of corrective action. Therefore, from a regulatory perspective, the No Action alternative will not be allowed.

Implementation Costs

The estimated capital and annual O&M cost for this alternative are both $0.

6.1.2 Alternative 2: Soil Excavation

Alternative 2 would include excavating all soils above the RAL of 8,470 mg/kg from the on-site areas, (including from within the footprint of the SWMUs), excavation of soils and sediments above the RAL of 4,954 mg/kg from the on-site grassy areas, and excavation of soils and sediments above remediation standards from Arlington Avenue right-of-way, railroad right-of-way and Big Four Road right-of-way. Drawing 1 shows the currently estimated area and depths of soil excavation required to remove all soils and sediments above the RAL/remediation standard corresponding to each area. The volume of soil and sediment to be excavated for Alternative 2 is estimated to be 3,224 cy in the on-site areas outside the SWMUs, 1,771 cy within the SWMUs, 1,057 cy from the on-site grassy areas, 3,177 cy from the railroad right of way, 1,269 cy from the Arlington Avenue right of way and 3,640 cy from the Big Four Road right-of-way.

Because the BHHRA did not identify an unacceptable risk for the off-site areas, remediation of the right-of-ways will be coordinated with the onsite remediation activities. Although not expected to occur, those areas not remediated concurrently with the onsite cleanup will have a well defined deed restriction recorded for the property that indicates that any future development or reuse of the property must be supported by the exposure scenarios evaluated in the BHHRA or the BHHRA must be rerun for the future proposed exposure conditions and cleaned to the appropriate levels. The deed restriction could be removed if Refined, or the current or future landowner remediates the property to appropriate levels for unrestricted use.

The area of pavement (concrete and bituminous) and building floors (all concrete) that must be removed to access the soils to be excavated are 3,366 sy for the SWMUs and 1,325 sy for the areas outside the SWMUs. The vertical limits of excavation were determined using the sample depth intervals. The horizontal limits of excavation were drawn between adjacent samples that were above and below the applicable RAL/remediation standard. Confirmatory soil sampling of excavations will be specified in the Corrective Measure Implementation Program Plan. For the purposes of the cost estimate provided in this report, we have assumed that 100 confirmatory samples will be required on the Refined property and another 50 will be required off-site and that the cost to collect and analyze each sample is $100.

Although not a required corrective measure, Alternative 2 will include the demolition of several buildings including the Material Storage Battery Breaker, Filter Press, and Wastewater Treatment Building and removal/closure of the Surface Impoundment. Concrete/masonry rubble and non-degradable debris generated during the decontamination and demolition of facility structures may be utilized for excavation backfill. The Surface Impoundment has a synthetic and concrete liner system. Removal of the filter press and wastewater treatment buildings will mean that storm water runoff and other water generated during corrective action could not be treated unless the existing system were replaced or relocated. Following completion of corrective action it is expected that the treatment system will be closed and storm water runoff will be discharged directly from the site through a storm water outfall.

The soil excavation activities would be performed using commonly available construction techniques and readily available equipment and qualified labor. The areas of floor and pavement to be removed will be limited to only those areas necessary to access the soil to be removed.

Excavated soil and sediment will be managed using on-site containment (Alternative 3A or 3B) and/or off-site disposal (Alternative 4). The building demolition will generate debris and rubble. Metal debris can be sent for recycling, but will require pressure-washing to remove dust and soil. The remaining debris and rubble from both the building and pavement demolition will require either inclusion in an on-site containment cell (Alternative 3A or 3B), use as excavation backfill, or off-site disposal (Alternative 4). Wood, trash and other degradable materials generated during demolition would be sent off-site for disposal even for the on-site containment cell alternatives.

Alternative 2 also includes excavation of soil and sediment from portions of the right of ways along Arlington Avenue and Big Four Road, and the ballast lined drainage ditch along the railroad right of way as indicated on Drawing 1.

Technical Considerations

The intended function of corrective action is to reduce human exposure to impacted soils whereby they no longer pose a potentially unacceptable risk. As summarized in the Baseline Human Health Risk Assessment, average lead concentrations will be reduced from 20,266 mg/kg to 920 mg/kg for the 0 to 60 inch soil horizon within the on-site area and from 13,392 mg/kg to 920 mg/kg for the 0 to 30 inch soil horizon within the grassy areas. Arsenic concentrations will be reduced from 82.4 mg/kg to 11.43 mg/kg for the 0 to 60 inch soil horizon in the on-site area and from 157 mg/kg to 12.5 mg/kg for the 0 to 30 inch soil horizon in the grassy areas. This represents greater than an order of magnitude reduction in soil lead concentration and nearly an order of magnitude reduction for arsenic. The off-site removal limits shown on Drawing 1 are expected to be from 6 to 18 inches in depth and will result in average lead concentrations for the off-site areas below 400 mg/kg. Actual removal limits and requirements for post-excavation sampling will be refined in the Corrective Measures Implementation Program Plan (CMI Plan).

There are no Site or waste specific characteristics that could diminish the effectiveness of Alternative 2. The long-term effectiveness of Alternative 2 would be high as no soils posing a potentially unacceptable risk to human health for the selected exposure scenarios would remain in excavated areas providing an unlimited useful life of the remedy for those areas. Alternative 2 controls the source of releases to reduce or eliminate further releases by excavating soils above the RAL/remediation standard corresponding to each area for placement in an on-site containment cell (Alternative 3A or 3B) or off-site disposal (Alternative 4).

Alternative 2 is reliable as it is a widely applied, proven technology and will require no operation and maintenance when completed. Alternative 2 can readily be combined with other remedies. In fact, it is assumed it will be combined with one of the on-site capping remedies (Alternatives 3A or 3B) or off-site disposal (Alternative 4).

The implementability of Alternative 2 would be fairly high as it only involves standard excavation techniques which are not difficult, only requires traditional demolition and excavation permits, would only impact on Site utilities which are inactive, and would use traditional construction equipment which is widely available. It is estimated that corrective action using Alternative 2 could be completed within 16 to 20 weeks after required permits and regulatory approvals are obtained.

Safety issues associated with this alternative would be those normally associated with general earthwork projects (e.g., confined space, slip/trip/fall hazards, electrical safety, work around heavy equipment, etc.). Potential release of contaminants during excavation and exposure of on Site workers and off-site individuals in the immediate vicinity of the Site are additional safety issues. Except for fuels used for power equipment used during excavation and work in the vicinity of the gas lines, Alternative 2 should not pose a fire or explosion hazard. All of these safety issues can be properly mitigated by implementation of an appropriate Health and Safety Plan.

Best Management Practices (BMPs) will be implemented during and after the work to prevent erosion. The BMPs include sediment control features such as silt fence, vegetative cover in disturbed areas, and storm water swales to convey storm water to a basin prior to discharge.

Environmental Considerations

As discussed in Section 6.1, the presence of, and current adverse effects to, habitats, biological communities, and plant and animal receptors by impacted soil and sediment appear to be minimal. Short and long term beneficial effects of Alternative 2 would be elimination of any adverse effects impacted soils and sediments may currently be having on these receptors. Adverse effects of Alternative 2 would be minimal – primarily the disturbance of minimal habitats, biological communities, and plants in excavation areas and a minimal potential for release of contaminants during excavation.

Erosion and sediment and dust control measures must be implemented during corrective action to prevent potentially contaminated sediment and dust from leaving the Site. The potential for impacts will be greatest during the period of active excavation. After the excavated areas have been backfilled and restored with pavement, stone or vegetation, the Site will be stable and the potential for the transport of dust and sediment from the Site to surrounding areas or drainage features will be lower than pre-corrective action conditions.

Alternative 2 would also be more protective of groundwater than current conditions as the most impacted soil and sediment would be remediated. Regarding the potential for migration from the remediated soil areas, insufficient data is available to complete a quantitative analysis; however, recognizing that the current concentrations in soil will be significantly reduced, it can be concluded that the potential for impact to groundwater will also be significantly reduced. Furthermore, it should be recognized that even under current conditions and historic operating conditions (before pavement of the majority of the on-site areas), the area represented by the impacted wells is limited to the most heavily utilized central portion of the Site while perimeter groundwater monitoring wells MW-4, MW-5 and MW-11 have never had an exceedance.

Human Health Considerations

The potential for short-term human exposure both for the workers performing the remediation and the surrounding community will be increased during the time of active remedial activities because of the increased potential for ingestion or inhalation of lead impacted dust. The Corrective Measures Implementation Program Plan (CMI Plan) should include specific measures to be implemented by the Contractor to minimize dust. The CMI Plan should also include measures to document the success of those measures such as air monitoring. Careful planning can minimize these potential risks. Engineering controls such as staged construction, water misting for dust suppression, and proper use of personal protective equipment can be used to mitigate exposures and potential releases during implementation. As contemplated in the BHHRA, Alternative 2 removes all soil and sediment exceeding the on-site and grassy area RALs and leaves no long term exposure considerations for commercial/industrial users of the Site. Soil and sediment remaining on-site after remediation could pose a potentially unacceptable risk to a residential user; therefore, deed restrictions would be required for the Site to prevent residential and/or similar use of the Site without additional corrective action. Alternative 2 also anticipates that off-site areas with lead above the USEPA residential screening level will be remediated or the property will be deed restricted against future residential use.

Alternative 2 removes contaminants for subsequent management under one of the capping alternatives and/or offsite disposal, thus, decreasing the mobility of contaminants. The toxicity of the contaminants would not change. The volume of contaminants will be reduced if Alternative 4 is used in conjunction with Alternative 2. Use of Alternatives 3A or 3B in conjunction with Alternative 2 would not reduce the volume of contaminants.

Institutional Considerations

A deed restriction would be recorded to prevent non-commercial/industrial use of the Site. Subject to state and local recording requirements, the restriction sought will include the agreement reached regarding the limitations of post-corrective measure implementation, unrestricted commercial/industrial use of the Site. The deed restriction will also specify that on-site groundwater can not be used for potable purposes.

It is not anticipated that Federal, State, and/or local environmental or public health regulations would pose a significant challenge to the design, operation, or timing of Alternative 2. Regulations applicable to this alternative include the following:

CODE OF FEDERAL REGULATIONS (CFR):

<u>40 CFR Protection of Environment</u>

40 CFR 50 - Clean Air Act National Ambient Air Quality Standards (NAAQS)
Section 109: Primary and secondary NAAQS which include lead and particulate

standards. These standards would be applied to soil and sediment excavation and building decontamination and demolition activities to ensure the protection of the workers and surrounding community. Dust control measures would be incorporated into the design and implementation of Alternative 2 to ensure NAAQS are maintained during corrective action. Measures implemented to maintain NAAQS should not significantly impact the timing of Alternative 2.

40 CFR 122 - National Pollution Discharge Elimination System (NPDES): Applies to discharges into surface waters via storm water or treatment process wastewater (Federal Clean Water Act). At the present time surface water from the on-site areas is collected, treated and discharged to the local POTW. During the implementation of corrective measures the Contractor will be required to continue operation of the treatment system and discharge to the POTW. Storm water accumulating within the remediation areas and rinsate water collected during the decontamination of buildings, equipment and personnel will also be processed through the treatment system. Treated effluent will be discharged to the POTW. Following the completion of corrective action, the treatment system will be decommissioned and the connection with the POTW will be terminated. A construction NPDES permit will be required during earth disturbance activities for the correction action (see 327 IAC 15-5).

40 CFR 260 - Hazardous Remediation Waste Management Requirements: Establishes requirements under RCRA for hazardous remediation waste treatment, storage and disposal during cleanup actions. Proper waste management procedures would be incorporated into the design and implementation of Alternative 2. Proper waste management should not significantly affect the timing of Alternative 2.

40 CFR 263 - Federal Department of Transportation (DOT) Rules for Hazardous Materials Transport: Regulates the transportation of hazardous materials including packaging, shipping and placarding. These rules are applicable to hazardous wastes shipped off-site for laboratory analysis, treatment or disposal. The Contractor and his subcontractors will be required to possess all required permits and approvals. Proper transportation of hazardous materials should be incorporated into the design and implementation of Alternative 2. Proper transportation of hazardous materials should not significantly affect the timing of Alternative 2.

40 CFR 265 – INTERIM STATUS STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT STORAGE AND DISPOSAL FACILITIES:

40 CFR 265 Subpart F – Groundwater Monitoring:

Requires owners of surface impoundments used to manage hazardous waste to implement a groundwater monitoring program. RMC has prepared and submitted to IDEM a Sampling and Analysis Plan for Groundwater Monitoring in the vicinity of the Surface Impoundment. Groundwater monitoring at the surface impoundment will be required until closure of the surface impoundment is completed. Note that 40 CFR 265.228 specifies groundwater monitoring is not required after all waste is removed. Groundwater monitoring should not significantly affect the timing of Alternative 2.

40 CFR 265 Subpart G – Closure and Post Closure:

Requires that owners of hazardous waste management facilities design and implement closure and post-closure as necessary. At the Site, the regulations are being applied to the SWMUs being closed under the purview of IDEM. 40 CFR 265.111 (a) states that the owner/operator must close the facility in a manner that minimizes the need for future maintenance. 40CFR 265.111 (b) states that the owner/operator must close the facility in a manner that controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products to the ground or surface waters or atmosphere. Closure and post-closure requirements (if applicable) would be incorporated into the design and implementation of Alternative 2. Closure and post-closure requirements should not significantly affect the timing of Alternative 2.

40 CFR Subpart K – Surface Impoundments:

Contains requirements for closure and post-closure of surface impoundments. Surface Impoundment Closure meeting the requirements of 40 CFR 265.228 would be achieved when accumulated sediments and the existing liner system have been removed. No soil removal is required beneath the concrete liner, as demonstrated by the results of Closure Soil Borings (CSBs) 43 through 47. The sediment would be managed with remediated on-site soils and the concrete portion of the liner system will be managed with other demolition debris/rubble. The synthetic liner system would be sent for off-site disposal. These closure activities would be incorporated into the design and implementation of Alternative 2. Closure of the surface impoundment is an activity common to all the alternatives; therefore, it is expected to effect the schedule of each alternative in a similar manner.

40 CFR Subpart L – Waste Piles:

Contains requirements for closure and post-closure of waste piles. The Interim Status Waste Piles would be closed by the removal of remaining waste and decontamination or removal of waste residues on structural equipment, building components and subsoils. To achieve this requirement, the floor and other building components within the indoor waste pile area would be cleaned. This would include the removal of accumulated dust and debris. After removal of the dust and debris and cleaning, the walls and roof would be removed and areas of soil that exceed the RAL established for the on-site area in the BHHRA would be removed. Only the floor areas overlying an area of proposed soil excavation would be removed. The areas of the former outdoor waste piles are protected by existing pavement. Under alternative 2 the pavement would be removed from those areas determined to have subsoils that exceed the RAL. This will achieve closure pursuant to 40 CFR 265.258. These closure requirements would be incorporated into the design and implementation of Alternative 2. Closure of the waste piles is an activity common to all of the alternatives; therefore, it is expected to affect the schedule of each alternative in a similar manner.

29 CFR LABOR

29 CFR 1900 - Occupational Safety and Health Administration (OSHA) Requirements:

General:

The Contractor and its subcontractors selected to perform the soil excavation activities will be required to perform all work in accordance with the requirements of OSHA. The Contractor will be required to develop and implement a Health & Safety Plan (HASP) that satisfies all relevant sections of 29 CFR 1900. Examples of significant sections to be included in the HASP that are related to Soil Excavation are as follows:

29 CFR 1904	Recording and Reporting;
29 CFR 1910	Occupational Safety and Health Standards (includes respiratory protection); and,
29 CFR 1926	Safety and Health Regulations for Construction (including Lead in Construction).

Health and safety precautions are common to all of the alternatives and should equally affect the timing of all alternatives.

INDIANA ADMINSTRATIVE CODE (IAC)

327 IAC 15-5

Rule 5 – Storm Water Runoff Associated with Land Disturbing Activities:

327 IAC 15-5-7

Requirements for controlling soil runoff during construction activities. The Soil Excavation Alternative will require the development of an Erosion and Sediment Control Plan (E/SCP) that contains the elements required in this section. The E/SCP must be submitted to the Soil & Water Conservation District for Marion County. Preparation of an E/SCP is a component common to all alternatives and should equally affect any of the alternatives.

329 IAC 3.1

Rule 10 – Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities:

329 IAC 3.1-10-1

Adopts by reference the requirements of 40 CFR 265: See relevant subsections cited above.

Implementation Costs

AGC's opinion of probable capital costs for the excavation activities that would be required under this alternative is $1,364,690. The costs are summarized in Table 3. This probable cost is specific to excavation and restoration of the excavated area only and does not include costs for on-site consolidation and capping or stabilization and off-site disposal. It does include the cost for decontamination of all, and demolition of some, facility structures and pavement. No long term operation and maintenance costs specific to soil remediation would be necessary, as these activities are specific to the selected alternative for final disposition (i.e. Alternatives 3A, 3B or 4).

6.1.3 Alternative 3A: On-Site Containment Cell with Composite Cap

Alternative 3A would consist of consolidating excavated soils into a designated area of the Site and constructing a composite cap. The location of the cell would be selected to be easily accessible for trucks and equipment hauling remediated soil as wells being in an area that could be easily graded to manage and direct storm water runoff. A conceptual containment cell location is provided on Drawing 1. The containment cell area would be prepared by clearing the selected area and creating a perimeter soil berm. Soils proposed for excavation as part of Alternative 2 that are situated within the footprint of the proposed cap would remain in-place and will not require excavation unless such soils are situated below the groundwater table in that area, in which case those soils will be excavated and the resulting excavation backfilled with soil with total lead concentrations below the RAL. The anticipated volume of soil and other materials to be placed in the cell would dictate the size. The cell will be sized to accommodate concrete, asphalt, and non-recyclable and non-degradable demolition debris from Site demolition activities. The contents will be graded to have a smooth finished surface with slopes between 3 and 33 percent. The capacity of the proposed footprint with 20% finished slopes will be on the order of 8,000 CY, if additional volume is required the steepness of the finished slopes would need to be increased. Finished slopes of 25% would provide approximately 9,500 cy and finished slopes of 33% would provide approximately 12,000 CY. The actual steepness will be established based on stability design calculations to be completed during the design process. Regardless of the final steepness of the cap, some portion of the off-site soils and sediment will not fit beneath the cap. Refined may wish to utilize those portions of the off-site soils and sediment below the USEPA Non-Residential Lead Screening Level (1,000 mg/KG) as on-site backfill and the soils and sediment that exceed that standard will be disposed off-site. In such a case, Refined must rerun the RAL calculations in the BHHRA using the actual soil lead concentration in-place of 50 mg/kg originally used. Care must be taken to ensure that the surface on which the liner will be placed will not puncture or in any other way damage the geomembrane component of the cap. This alternative would be performed in conjunction with Alternative 2. A groundwater monitoring system will be installed around the containment cell to ensure the containment cell is working as intended.

Technical Considerations

The intended function of the corrective action is to reduce human exposure to impacted soils whereby they no longer pose a potentially unacceptable risk. Alternative 3A (combined with Alternative 2) achieves this function. There are no Site or waste specific characteristics that could diminish the effectiveness of Alternative 3A. The long-term effectiveness of Alternative 3A would be high as long as the composite cap was maintained. With routine maintenance of the composite cap (e.g., routine inspection of the cap, mowing of the vegetative cover, periodic repair of dead vegetation, periodic repair of minor erosion, etc.), it is anticipated that the life of such a cap would be greater than 30 years. Alternative 3A controls, reduces or eliminates the source of potential future releases by encapsulating the remediated soils and sediment beneath a cap that will include an impermeable geomembrane barrier covering the entire footprint of the Containment Cell. The 24" thick layer of soil (6" topsoil and 18" cover soil) will protect the geomembrane from degradation, damage and vandalism. The composite cap system prevents vertical migration of the constituents of concern from the waste contained within the cell by preventing infiltration. A deed restriction will also be posted for the portion of the property occupied by the Containment Cell that will prevent future disturbance, excavation or other activity that could result in the release of the contents.

Alternative 3A is reliable as it is a widely applied, proven technology; however, it will require some O&M when completed. The geomembrane layer provides a more dependable impermeable barrier than asphalt or soil alone. O&M requirements are not anticipated to be complex. O&M activities would include routine inspection of the cap, regular mowing of the vegetative cover, and periodic repair of minor damage (e.g., dead vegetation on cover, minor erosion, etc.). Composite caps have been successfully used at many other sites and can readily be combined with Alternative 2.

The implementability of Alternative 3A would be fairly high, although less so than Alternative 3B because installation of the geomembrane component of the cap will require specially trained installers. While Alternative 3A is technically the most complex alternative, it can be implemented provided a qualified contractor experienced with installation of such caps is hired and appropriate QA/QC measures are implemented. Alternative 3A would only require traditional construction permits, would only impact Site utilities which can not be abandoned, would not extend to the groundwater table, and would use traditional construction and HDPE fusing equipment which is widely available. It is estimated that once excavated material is placed in the cell (see Alternatives 2 for excavation timeframes) and all required permits are obtained, installation of the composite cap could be completed in 4 to 6 weeks.

Safety issues associated with Alternative 3A are similar to those already relevant to managing the soils from the excavation activities, all of which can be properly mitigated by implementation of an appropriate health and safety plan. An experienced liner crew will be required for installation of the HDPE geomembrane.

Best Management Practices (BMPs) will be implemented during and after the work to prevent erosion. The BMPs include sediment control features such as silt fence, vegetative cover in disturbed areas, and storm water swales to convey storm water to a basin prior to discharge.

The groundwater monitoring system will consist of four wells around the perimeter of the cell. Tentatively, it is expected that existing well MW-9 will function as the background well and three new wells will be installed to serve as down-gradient wells. Groundwater samples will be monitored in the field for pH, turbidity, temperature, ORP and dissolved oxygen and conductivity and in the laboratory for lead and arsenic. Specifics regarding the groundwater monitoring program will be established in the CMI Plan.

Environmental Considerations

Alternative 3A will result in the remediated soils remaining at the Site in a dedicated and defined area. As discussed in Section 6.1, the presence of habitats, biological communities, and plant and animal receptors at the Site appear to be minimal. The location for the containment cell will be located in an area which is already paved/covered with buildings, or immediately adjacent to such an area. As such, it is not anticipated that habitats, biological communities, plant, and/or animal receptors at the proposed cell location would be appreciable. It is anticipated that construction of a composite capped cell would have minimal short and long term adverse effects. The potential exists for the release of dust and sediment during cell construction and placement of excavated soil, although careful planning can minimize these potential risks. The completed cell will have a 24 – inch thick layer of "clean soil" that will protect the impermeable layer of the cap from damage by burrowing animals. The potential for a breech of the cover system for the completed containment cell is considered to be very low.

Human Health Considerations

The short-term potential for human exposure both for the workers performing the remediation and the general public will be increased during placement and compaction of the remediated soils. This is primarily the result of an increased potential for dust and direct contact with the soil. The Corrective Measures Implementation Program Plan (CMI Plan) should include specific measures to be implemented by the Contractor to minimize exposure to dust and soil, and protocol for collecting analytical data to document the effectiveness of those measures. Careful planning can minimize these potential risks. Engineering controls such as staged construction, water misting for dust suppression, and proper use of personal protective equipment can be used to mitigate exposures and potential releases during implementation. Provided the composite cap is maintained, human exposure to capped material should remain low over time. Soil and sediment remaining at the Site after remediation could pose an unacceptable risk to a residential user of the Site; therefore, a land restriction would be required to prevent residential and/or similar use of the Site without additional correction action.

Alternative 3A caps all of the impacted soil excavated from the Site under Alternative 2, thus decreasing the mobility of contaminants. Alternative 3A does not decrease the volume or toxicity of contaminants at the Site.

Institutional Considerations

A deed restriction would be implemented to prevent disturbance of the on-site containment cell. This deed restriction would be implemented concurrently with the deed restriction for Alternative 2.

It is not anticipated that Federal, State, and/or local environmental or public health regulations would pose a significant challenge to the design, operation, or timing of this alternative. The regulations applicable to this alternative would be same as those applicable to Alternative 2.

Implementation Cost

AGC's opinion of probable capital cost for Alternative 3A is $227,936. The 30 year O&M cost is $488,382. The present worth of the O&M costs is $174,000. The costs are summarized in Table 4.

6.1.4 Alternative 3B: On-Site Containment Cell with Asphalt Cap

Alternative 3B would be performed in conjunction with excavation Alternative 2. The general construction and performance aspects of the asphalt cap would be similar to the composite cap except that no geosynthetic liner components would be present in the cover and the soil would be replaced by crushed stone and asphalt. Alternative 3B would consolidate the remediated soils into a single location at the Site. Soils proposed for excavation as part of Alternative 2 that are situated within the footprint of the proposed cap would remain in-place and will not require excavation unless such soils are situated below the groundwater table in that area, in which case those soils will be excavated and the resulting excavation backfilled with soil with total lead concentrations below the RAL. The containment cell would have a defined area and an engineered cover. The cover would protect against direct contact and the infiltration of precipitation into the consolidated soils. A groundwater monitoring system will be installed around the containment cell to ensure the containment cell is working as intended.

Technical Considerations

The asphalt cap would rely on the integrity of the asphalt to prevent infiltration of precipitation and inadvertent contact by receptors. A geotextile fabric would be placed at the base of the aggregate layer to reduce the potential for cracking of the asphalt section. The asphalt will provide a continuous barrier. A higher level of maintenance would be necessary to maintain the cover than the composite cover presented as Alternative 3A. The finished slopes would be between 3 and approximately 15 percent which would likely result in a lower profile than the composite cap. The approximate air space for the footprint shown at 15% maximum slopes would be on the order of 6,400 cy which would provides only minimal excess capacity above the currently projected volume of on-site soils to be remediated (6,052 cy). Based on the proposed footprint and side slopes, some portion of the off-site soils and sediment will not fit beneath the cap. Refined will propose to utilize those portions of the off-site soils and sediment below the

USEPA Non-Residential Lead Screening Level (1,000 mg/KG) as on-site backfill and the soils and sediment that exceed that standard will be disposed off-site. The finished cap surface could be integrated to provide usable Site area (such as a parking lot or outdoor material storage area) that would make the Site more conducive to redevelopment. Alternative 3B controls, reduces or eliminates the source of potential future releases by encapsulating the remediated soils, sediment and debris beneath an asphalt, crushed aggregate and geotextile cap that covers the entire footprint of the Containment Cell. The asphalt component of the cap system, when properly maintained, prevents infiltration of precipitation. The asphalt layer also provides a barrier between potential receptors and the impacted materials contained within the cell. The asphalt cap system prevents vertical migration of the constituents of concern from the waste contained within the cell by preventing infiltration. A deed restriction will also be posted for the portion of the property occupied by the Containment Cell. The deed restriction will help prevent future disturbance, excavation or other activity that could result in the release of the contents.

The location of the cell will be as shown on Drawing 1. The containment cell area would be prepared by clearing the selected area and creating a perimeter soil berm. The anticipated volume of soil and other materials to be placed in the cell would dictate the size, which would currently result in a footprint of approximately 1.15 acres.

The intended function of corrective action is to reduce human exposure to impacted soils whereby they no longer pose a potentially unacceptable risk. Alternative 3B (combined with Alternative 2) achieves this function. There are no Site or waste specific characteristics that could diminish the effectiveness of Alternative 3B. The long-term effectiveness of Alternative 3B would be high as long as the asphalt cap was maintained. With routine maintenance of the asphalt cap (e.g., sealing of cracks, seal coating etc.), it is anticipated that the life of such a cap would be greater than 30 years.

Alternative 3B is reliable as it is a widely applied, proven technology; however, it will require some O&M when completed. O&M requirements are not anticipated to be complex. O&M activities would include routine inspection of the asphalt, periodic fill of cracks, and infrequent sealing and/or repaving. Bituminous concrete pavement (i.e., asphalt) is widely utilized for containment of waste materials that are relatively insoluble, such as lead and can readily be combined with Alternative 2.

The implementability of Alternative 3B would be fairly high as it would only require traditional construction permit, would only impact on Site utilities which can not be abandoned, would not extend to the groundwater table, and would use traditional construction equipment which is widely available. It is estimated that once excavated material is placed in the cell (see Alternatives 2 for excavation timeframes) and all required permits are obtained, capping could be completed in 4 to 6 weeks.

Safety issues associated with Alternative 3B are similar to those already being managed for the excavation activities (see Alternative 2). All of these can be properly mitigated by implementation of an appropriate health and safety plan.

Best Management Practices (BMPs) will be implemented during and after the work to prevent erosion. The BMPs include sediment control features such as silt fence, vegetative cover in disturbed areas, and storm water swales to convey storm water to a basin prior to discharge.

The groundwater monitoring system will consist of four wells around the perimeter of the cell. Existing well MW-9 will function as the background well and three new wells will be installed to serve as down-gradient wells. Groundwater samples will be monitored in the field for pH, turbidity, temperature, ORP, dissolved oxygen and conductivity and in the laboratory for lead and arsenic. Specifics regarding the groundwater monitoring program will be established in the CMI Plan.

Environmental Considerations

Alternative 3B would result in the remediated soils remaining at the Site in a dedicated and defined area. As discussed in Section 6.1, the presence of habitats, biological communities, and plant and animal receptors at the Site are believed to be minimal. While the location for a containment cell has not been selected, it is likely that the cell would be located in an area already paved/covered with buildings, or a landscaped grassy area immediately adjacent to such areas. As such, it is anticipated that habitats, biological communities, plant, and/or animal receptors at that location would be minimal. It is anticipated that construction of an asphalt capped cell would have minimal short and long term adverse effects. The potential exists for the release of dust and sediment during cell construction and placement of excavated soil and sediment, although careful planning can minimize these potential risks. The potential for a breech of the cover system for the completed containment cell that would result in the release of contained soils into the environment is considered to be low, although the asphalt cap would not be as protective as the composite cap.

Human Health Considerations

The short-term potential for human exposure both for the workers performing the remediation and the general public would be increased during placement and compaction of the remediated soils. This is primarily the result of an increased potential for exposure to dust and soil that could result in inhalation or ingestion. The Corrective Measures Implementation Program Plan (CMI Plan) should include specific measures to be implemented by the Contractor to minimize exposure to dust and soil, and protocol for collecting analytical to document the effectiveness of those measures. Careful planning can minimize these potential risks. Engineering controls such as staged construction, water misting for dust suppression, and proper use of personal protective equipment can be used to mitigate exposures and potential releases during implementation. Provided the asphalt cap is maintained, human exposure to capped materials should remain low over time. Soil and sediment remaining at the Site after remediation could pose an unacceptable risk to a residential user of the Site; therefore, a land restriction would be required to prevent residential and/or similar use of the Site without additional corrective action.

Alternative 3B caps the impacted soil and sediment excavated under Alternative 2, thus decreasing the mobility of contaminants. Alternative 3B does not decrease the volume or toxicity of contaminants.

Institutional Considerations

A deed restriction on the Site would be implemented to prevent disturbance of the on-site containment cell. This deed restriction would be implemented concurrently with the deed restriction for Alternative 2.

It is not anticipated that Federal, State, and/or local environmental or public health regulations would pose a significant challenge to the design, operation, or timing of this alternative. Regulations applicable to this alternative would be similar to those listed above for Alternative 3A.

Implementation Cost

AGC's opinion of probable capital cost for construction of an on-site containment cell with an asphalt cap is \$206,294. The 30 year O&M costs for is \$494,028. The present worth of the O&M is \$176,012. The costs are summarized in Table 5.

6.1.5 Alternative 4: Treatment and Off-Site Disposal

Alternative 4 would be utilized with the excavation of the impacted soils under Alternative 2. The excavated materials would be stabilized as necessary to meet land disposal and disposal facility requirements and shipped to a permitted off-site disposal facility. After being stabilized, the soil will be loaded onto trucks. The trucks must be permitted for use in transporting waste materials and all required paper work must be completed. The CMI Plan would need to include a large area to facilitate the stockpiling, mixing and loading of soils.

Technical Considerations

The intended function of corrective action is to reduce human exposure to impacted soils and sediment whereby they no longer pose a potentially unacceptable risk. Alternative 4 (combined with Alternative 2) achieves this function. There are no Site or waste specific characteristics that could diminish the effectiveness of Alternative 4. The long-term effectiveness and permanence of this alternative is high since the soils and sediments with concentrations greater than the RAL/remediation standard will be removed from the Site, providing an unlimited useful life of the remedy. Alternative 4 reduces or eliminate the long term potential for releases at the Site by disposing of the excavated soil off-site. Alternative 4 increases the short term potential for release of impacted soil to off-site areas because of increased level of handling and transportation over public roadways. The volume of impacted soil remains unchanged. Chemical fixation will reduce the toxicity but not reduce the concentration of lead in the soil.

Alternative 4 is reliable as it is a widely applied, proven technology and will require no O&M at the Site when completed. Alternative 4 can readily be combined with other remedies. In fact, it is assumed it will be combined with Alternative 2.

The implementability of Alternative 4 is high as it only involves standard soil and sediment handling techniques and soil and sediment stabilization processes which are common. Alternative 4 does not require any special permits, does not impact Site utilities, would not extend to the groundwater table, and would use traditional construction and stabilization equipment – both of which are widely available. It is estimated that once soil and sediment is excavated (see Alternative 2 for excavation time frame) corrective action using Alternative 4 could be completed within the 12 to 16 weeks required for Alternative 2 provided all regulatory and landfill approvals are in-place at the start of excavation activities.

Safety issues associated with Alternative 4 would be similar to those already being managed for the excavation activities, all of which can be properly mitigated by implementation of an appropriate health and safety plan. The primary modes of potential release to occur are dust and erosion. Release could also occur if a truck transporting the soils were to spill its load. Careful planning can minimize these risks and their potential impacts.

Environmental Consideration

Alternative 4 would treat and dispose off-site all soils and sediments excavated from the Site. As discussed in Section 6.1, the presence of habitats, biological communities, and plant and animal receptors at the Site are believed to be minimal. While the location for treatment and staging has not been selected, it is likely it would be located in an area already paved/covered with buildings. As such, it is anticipated that impact to habitats, biological communities, plant, and/or animal receptors at that location would be minimal. Therefore, it is anticipated that Alternative 4 would have minimal short and long term adverse effects. The potential exists for the release of dust and sediment during treatment and loading of the soil/sediment, although careful planning can minimize these potential risks.

Human Health Considerations

The potential for human exposure both for the workers performing the remediation and the general public will be increased during stabilization, loading and transportation of the remediated soils. This is primarily the result of an increased potential for exposure to dust and soil that could result in inhalation or ingestion. The CMI Plan should include specific measures to be implemented by the Contractor to minimize exposure to dust and soil, and protocol for collecting analytical to document the effectiveness of those measures. Careful planning can minimize these potential risks. Engineering controls such as staged construction, water misting for dust suppression, and proper use of personal protective equipment can be used to mitigate exposures and potential releases during implementation. As contemplated in the BHHRA, Alternative 4 removes all soil exceeding the RAL/remediation standard and leaves no long term exposure considerations for commercial/industrial users of the Site. Soil and sediment remaining at the Site after remediation could pose an unacceptable risk to a residential user of the Site; therefore, a land restriction would be required to prevent residential and/or similar use of the property without additional corrective action.

Alternative 4 removes soil excavated under Alternative 2, thus reducing the volume and mobility of contaminants. Stabilization activities associated with disposal would reduce the mobility of the contaminants.

Best Management Practices (BMPs) will be implemented during and after the work to prevent erosion. The BMPs include sediment control features such as silt fence, and vegetative cover in disturbed areas.

Institutional Considerations

It is not anticipated that Federal, State, and/or local environmental or public health regulations would pose a significant challenge to the design, operation, or timing of Alternative 4. Regulations applicable to Alternative 4 would be similar to those discussed for Alternative 2.

Implementation Cost

AGC's opinion of probable capital cost for this alternative is $976,946. The costs are summarized in Table 6.

6.2 GROUNDWATER

6.2.1 Alternative 1: No Action

Technical Considerations

The No Action alternative does not involve any corrective action measure for which technical considerations can be evaluated. As a result, the technical considerations (performance, reliability, implementability and safety) for Alternative 1 are not applicable. Alternative 1 does not reduce the mobility or volume of contaminants at the Site nor does it control the source of releases to reduce or eliminate further releases. This alternative serves as a baseline for comparison.

Environmental Considerations

Groundwater at the Site in the area of the former Wastewater Treatment, Filter Press, Battery Breaker, and the areas north and west of the Material Storage Building exceeds the USEPA's MCL for lead and/or arsenic based on the most recent groundwater sampling event in January 2007 and previous sampling events. As discussed above, the elevated arsenic concentration in MW-3 is not indicative of the water quality in the area and was excluded from the analysis. These conditions would not be actively changed under the No Action Alternative.

The primary sources of arsenic and lead contaminants to groundwater were previous operations at the facility and the arsenic and lead in soil above the impacted groundwater. Operations at the facility have ceased. The impacted soil at the site serves as a finite source of contaminants into the groundwater, and contaminant mass in the groundwater is not expected to increase.

The dissolved phase arsenic and lead has the potential to migrate downgradient. Based on the sampling results, concentrations of lead and arsenic are below USEPA's MCL levels where the groundwater leaves the property at the southeastern corner of the site. There have been no potential receptors identified. The No Action alternative would not provide any long term prevention or protection against off-site migration of contaminants; however, sampling results indicate that impacted groundwater is not advancing. The contaminated plume would not be monitored under this alternative so that adverse effects to receptors not yet identified could not be predicted in the future.

Human Health Considerations

Alternative 1 does not actively change lead and arsenic concentrations in the short or long term or reduce the toxicity, mobility, or volume of lead and arsenic impacted groundwater, although such changes may occur to some degree naturally.

Currently, deed restrictions are not in place at the facility; therefore, there is a potential for human exposure at the site if potable groundwater wells in the perched zones were to be installed, although the perched zone would not be capable of supporting any significant or prolonged extraction. Currently, the manufacturing facility and surrounding facilities are connected to public water which means that no complete exposure pathways for groundwater exist.

Risks associated with potential exposure pathways (future potable groundwater wells) would remain unchanged with the No Action Alternative.

Institutional Considerations

The No Action Alternative does not include any institutional controls. Design and operation are not required under this alternative; therefore, institutional controls will not be impacted by local or regulatory agencies.

Implementation Costs

The estimated capital and annual O&M costs for this alternative are both $0.

6.2.2 <u>Alternative 2: Institutional Controls</u>

Technical Considerations

The Institutional Controls alternative would involve placing limitations on the use of groundwater at the Site to prevent consumption by human receptors. The institutional controls would be applied in the form of deed restrictions that would prevent the installation and development of potable groundwater wells. The deed restrictions would apply to current and future property owners.

Deed restrictions are effective, reliable and can easily be implemented at the Site.

Environmental Considerations

The Environmental Considerations for the Institutional Controls alternative are identical to the No Action alternative for soil and sediment as presented in Section 6.1.

Human Health Considerations

Similar to the No Action alternative, Alternative 2 does not meaningfully change lead and arsenic concentrations in the short or long term or reduce the toxicity, mobility, or volume of lead and arsenic impacted groundwater, although limited reductions may occur naturally.

The Institutional Controls alternative addresses the potential for human exposure at the site if potable groundwater wells were to be installed. Deed restrictions would be applied to prevent installation and development of potable groundwater wells. Implementation and adherence to these deed restrictions will prevent the potential risks for human consumption of groundwater and will ensure that the direct exposure to groundwater does not occur.

Institutional Considerations

RMC would prepare the deed restrictions and the USEPA and local regulatory agencies would review the Deed Restrictions. Therefore, the timing and duration to complete this task is highly dependant on the parties involved.

Implementation Costs

The estimated cost to prepare and file the deed restrictions is approximately $4,500.

6.2.3 Alternative 3: Source Removal

Source Removal would consist of remediating soils with lead and arsenic concentrations that could leach arsenic or lead to groundwater at levels exceeding the closure levels for groundwater, as calculated using the Soil-to-Groundwater Partitioning Model and placing them beneath an impermeable cap or disposing them off-site. The Remedial Action Levels for soil and sediment developed under the BHHRA are for non-residential use of the property and will require placing a deed restriction on the property prohibiting future residential land use. The concentration of lead and arsenic that may remain in-place after remediation and not degrade groundwater (as determined by the Soil-to-Groundwater Partitioning Model) will be calculated after the additional SPLP testing discussed in Section 3.3.2 is collected. If necessary, the soil removal limits will be adjusted during preparation of the CMI Plan, to reflect additional soil removal necessary to protect groundwater.

Technical Considerations

The elevated concentrations of arsenic and lead in groundwater are seen primarily west and north of the Material Storage Building in the area identified as the outdoor waste piles which had been unpaved throughout their use. Lead and arsenic concentrations are below appropriate regulatory limits where the groundwater leaves the Site in the southeastern corner. The deepest proposed soil removal areas coincide with the elevated concentrations of arsenic and lead in groundwater. Source removal will reduce future impacts to groundwater by significantly decreasing the lead and arsenic concentration in the soil that may be leaching to groundwater.

As mentioned above, the pre-remediation average observed lead and arsenic concentration in the top 24 inches of the borings conducted in the former waste pile areas adjacent to MW-2S, MW-7 and MW-8 are 42,776 mg/kg and 254.2 mg/kg, respectively. After the soil removal proposed as Alternative 2 for soil and sediment is completed, the average concentration of lead and arsenic for the next deeper soil samples will be 368 mg/kg and 12.1 mg/kg respectively. At RSB-9, near MW-10, the concentrations of lead and arsenic that will remain after soil removal are 3,800 mg/kg and 27 mg/kg respectively. In the vicinity of MW-1, the average lead and arsenic concentrations that will remain based on borings RSB-54, 55 and 57) are 2,001 mg/kg and 9.7 mg/kg respectively.

Removing the source will allow arsenic and lead concentrations in groundwater to reduce over time to below the appropriate regulatory limits. The time necessary to experience the reduction in groundwater sample results cannot be precisely quantified, but is expected to be between two and five years. A detailed evaluation of implementability and safety of the soil removal is presented in Section 6.1.2.

Environmental Considerations

Improvements in groundwater will not benefit the plant and animal receptors on site or adjacent to the site due to the depth of the groundwater and the absence of current exposure. A detailed description of environmental considerations associated with soil removal is provided in Section 6.1.2.

Human Health Considerations

Currently, deed restrictions are not present at the site. There is a human health risk associated with the installation and development of potable wells within the perched groundwater zones onsite, at the present concentrations. The installation of potable wells onsite is unlikely due to the existing public water supply. Removing the source (i.e. soil removal) will reduce groundwater concentrations and over time the risks associated with potable well installation and use will decrease. A deed restriction prohibiting residential and potable well installation and use is recommended, as presented in Alternative 2.

Additional detailed information on the human health risks associated with the soil removal is provided in Section 6.1.2.

Institutional Considerations

It is not anticipated that Federal, State, and/or local environmental or public health regulations would pose a significant challenge to the design, operation, or timing of Alternative 3. A detailed evaluation of appropriate regulations for the soil removal is provided in Section 6.1.2.

Cost

The cost for this alternative is provided in Section 6.1.2

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6.2.4 Alternative 4: Monitored Natural Attenuation

MNA can effectively reduce the dissolved concentrations and/or toxic forms of inorganic contaminants, such as arsenic and lead, in groundwater. Attenuation of metals is believed to be occurring at the Site by sorption reactions such as precipitation, adsorption on the surfaces of soil minerals, absorption into the matrix of soil minerals, or partitioning into organic matter. Sorption reactions are some of the dominant mechanisms responsible for the reduction of mobility, toxicity, or bioavailability of inorganic contaminants. Groundwater chemistry data from the January 2007 groundwater sampling event supporting sorption and more specifically adsorption are the following:

High iron concentrations (typically >1mg/L);

High bicarbonate alkalinity (290 mg/L to 520 mg/L);

Near neutral pH levels;

Low Total Organic Carbon (TOC); and

Low Oxydation-Reduction Potential (ORP) levels.

In addition to the presence of aquifer conditions conducive to sorption, given the high partitioning coefficients measured for lead and arsenic and the resulting high retardation factor, the distance traveled by lead and arsenic in groundwater is a fraction of a foot per year. As shown in the calculations provided in Appendix C, the distance traveled since operations began at the facility in 1968, even in sand with a hydraulic conductivity of 40 ft/day, would be 30 feet for arsenic and 17 feet for lead. At this rate and following the flow paths shown on Figure 2, arsenic contamination from the outdoor waste pile area would take 1,187 years to reach the southern property line, and lead would take 2,089 years.

Technical Considerations

The current configuration of the arsenic and lead plumes above regulatory limits is stable and generally has not moved downgradient. This is demonstrated by the perched downgradient wells with concentrations below regulatory limits and the calculations discussed above. The groundwater gradient indicates a general flow toward the east and then toward the south. The inability of the plumes to move downgradient (low mobility) without an active remedial system indicates that natural attention factors are in place.

Neutral pH conditions present at the site are favorable for metals precipitation. Elevated calcium concentrations present in the groundwater most likely due to the presence of calcium carbonate and the presence of alkalinity provide stable pH conditions. This is important because inorganics can become mobile at lower pH; however, the elevated calcium and presence of alkalinity provide the conditions that resist changes in pH. Elevated levels of iron in the presence of hydroxides also indicate a tendency for iron hydroxide to form which can enhance the precipitation of arsenic and lead. In the presence of sulfides, arsenic and lead can precipitate as arsenic sulfide and lead sulfide. Lead and Arsenic co-precipitation with iron hydroxide may be occurring due to the presence of iron. Sulfides are not present in the groundwater, therefore one can conclude that arsenic and lead precipitation as a sulfide is not occurring. Low ORP and low TOC also favor adsorption of arsenic and lead.

As mentioned above, the previous rounds of sampling over an 8 year period provides the information necessary to demonstrate a stable arsenic and lead plume.. The primary natural attention mechanisms present as indicated by the sampling data are precipitation and sorption. The performance and reliability is demonstrated by the sampling data that has been collected to date which indicates a plume that has been relatively immobile.

The MNA alternative has a level of implementability since the monitoring wells have been installed; therefore, continuation of monitoring the wells is straightforward. The safety aspect of this alternative is very high since construction is not required under this alternative.

MNA processes reduce the mobility of the arsenic and lead plume and in addition can render the arsenic and lead unavailable when the arsenic and lead precipitate. Since the arsenic and lead plumes are not moving downgradient, a joint remedy of source removal (soil) and MNA for the residual plume may be appropriate.

The sampling program associated with the monitored natural attenuation will be developed and submitted to the USEPA in the event that this alternative is chosen.

Environmental Considerations

Improvements in groundwater will not benefit the plant and animal receptors on site or adjacent to the site due to the depth of the groundwater.

Human Health Considerations

Alternative 4 naturally reduces the toxicity and mobility of arsenic and lead. The volume of available contaminants is reduced; however, the total volume of contaminants is not reduced.

Additional human health risks associated with this remedy are to the workers that will sample the monitoring wells.

Institutional Considerations

It is not anticipated that Federal, State, and/or local environmental or public health regulations would pose a significant challenge to the MNA alternative.

Cost Considerations

The cost associated with the groundwater portion is primarily the monitoring of the plume. The cost for this is on the order of $200,000. Since a MNA sampling plan has not been developed, many assumptions on the wells to be sampled and frequency of sampling were made in estimating a cost. This is why a magnitude of order cost is provided.

6.2.5 Alternative 7: Groundwater Extraction and Treatment

Alternative 7 involves the planning, design, installation, and operation of a groundwater extraction and treatment system. Extraction wells or trenches are either placed at the downgradient end of the source area/plume or within the source area/plume depending on the remedial objective and characteristics of the plume and geology. At this Site, since the plume is relatively immobile, the extraction wells would most likely be placed within the highest concentration areas (below the soil with elevated concentrations of arsenic and lead). The exact number of wells/trenches would be determined during the design phase with the objective being mass removal within a reasonable time frame and plume containment. The extracted groundwater would be pumped to a groundwater treatment system on site, treated, and discharged through a permitted NPDES discharge location, re-injection, or discharged to the POTW.

Technical Considerations

A groundwater extraction and treatment system would provide contaminant reduction within the Site groundwater by extracting contaminated groundwater thereby reducing the mass present onsite. This is a proven technology for many organic constituents with thousands of installations around the country although experiences with inorganics, especially at lower concentrations, has been only marginally successful. The amount of contaminant reduction over time is based on the extraction rate, concentration, and hydrogeology of the Site. The extraction method would be determined during the design, however for costing purposes it is assumed that six wells would be installed along the centerline of the plume.

Ion-exchange resins and chemical precipitation are two treatment technologies that would be evaluated for arsenic and lead removal. These technologies treat inorganics by adsorption or precipitation. These technologies do not reduce contaminant mass since the contaminants are adsorbed onto a media or form a sludge. These new wastes would be in a solid form and be treated either onsite through regeneration (ion exchange) or sent offsite as a sludge (precipitation).

The treatment system may require a pretreatment system to address the high levels of calcium and magnesium. This would be addressed during the design. Bench and pilot scale studies would be conducted with the groundwater to determine the appropriate treatment system. The treatment levels are highly dependant on the discharge location. Therefore, all three discharge options would be investigated prior to establishing treatment levels.

Groundwater extraction and treatment systems are reliable provided the appropriate amount of controls and supervision is present. High levels of O&M are typically associated with groundwater extraction and treatment systems. The operations costs are primarily related to maintaining pumps and equipment; exchanging treatment media; sludge disposal costs; and electricity.

The implementability of this Alternative is low compared to the other alternatives since and extraction and treatment system would be constructed and discharge permits would have to be obtained.

Safety issues associated with this alternative are with standard construction risks associated with building the treatment building and installing the extraction and treatment system.

Environmental Considerations

Improvements in groundwater will not benefit the plant and animal receptors on site or adjacent to the site due to the depth of the groundwater.

Human Health Considerations

Alternative 7 will actively remove contaminants from the groundwater therefore the toxicity would be reduced. The mobility of arsenic and lead would remain unchanged with this alternative.

Additional human health risks associated with this remedy are short term primarily to the workers and general public that will be exposed to impacted soil and groundwater during construction of the footers for the treatment building and the extraction system. The Corrective Measures Implementation Plan (CMI Plan) should include specific measures to be implemented by the Contractor to minimize exposure to dust and soil, and protocol for collecting analytical data to document the effectiveness of those measures. Careful planning can minimize these potential risks. Engineering controls such as staged construction, water misting for dust suppression, and proper use of personal protective equipment can be used to mitigate exposures and potential releases during implementation.

Institutional Considerations

It is not anticipated that Federal, State, and/or local environmental or public health regulations would pose a significant challenge to this alternative. Permitting will be required to discharge treated groundwater; therefore, this alternative will require additional considerations compared to the other alternatives.

Cost Considerations

The most likely capital cost for this option is $535,200. Given the limited aerial extent, perched groundwater conditions, and the expectations that any groundwater remedy would be performed in conjunction with source removal, we have assumed that extraction would only be performed for 5 years. The associated operating cost for a 5 year period is estimated to be $100,625, which assuming a straight line cost and an interest rate of 3.5% has a present value of $90,865.

7.0 RECOMMENDATION FOR CORRECTIVE MEASURE ALTERNATIVE

Based on the evaluation described above, RMC and Advanced GeoServices Corp. (AGC) are recommending selection of Alternative 2 (excavation of on-site soils and sediment >RAL and off-site soil and sediment in right-of-ways above the USEPA residential soil screening level) with Alternative 3A (On-Site Containment Cell with composite cap) for as much as can be accommodated on-site, and off-site disposal (Alternative 4) for those materials that can not be accommodated beneath the composite cap for soil and sediment.

RMC is recommending Alternative 2 for soil and sediment on the basis that the facility will be restricted to only commercial or industrial land uses and off-site properties can not be deed restricted. The deed restrictions for the Site will be well-defined and recorded on the deed for the facility property. Refined or the new owner of the facility will propose additional evaluation and corrective action if any future redevelopment or reuse of the facility is not supported by the proposed construction worker scenario cleanup levels. The appropriate scenario and the appropriate cleanup levels should be selected at that time. The following considerations were critical in selection of the recommended alternatives.

Alternative 2

1) Alternative 2 will result in the excavation of all Site soil and sediment exceeding the Remedial Action Level and off-site soil and sediment exceeding the remediation standard.

2) Because we are recommending an on-site containment alternative (3A) a portion of the additional soil and sediment generated from off-site remediation areas will also be placed beneath the composite cap.

3) If all on-site soils greater than the RAL are remediated, then fewer restrictions will be required on future landowners or tenants.

4) On-site soil remediation to the proposed RALs will reduce average lead concentrations by greater than an order of magnitude to a PRG of 920 mg/kg.

5) Remediation of off-site soil and sediment to the USEPA residential screening level will allow unrestricted future use of those properties.

6) Because not all of the soils and sediment generated from the off-site areas will fit beneath the containment cell composite cap, timing of off-site remediation can be determined with the property owners. Those areas not remediated concurrently with the onsite cleanup will have a well defined deed restriction recorded for the property that indicates that any future development or reuse of the property must be supported by the exposure scenarios evaluated in the BHHRA or the BHHRA must be rerun for the future proposed exposure conditions and cleaned to the appropriate levels. The deed restriction would be removed if Refined or the current or future landowner remediates the property to the USEPA residential screening level or a site specific residential level.

<u>Alternative 3A</u>

1) The constituents of concern subject to remediation at this Site (lead and arsenic) can easily be managed by a composite cap to prevent impact to other areas of the Site and surrounding areas.

2) Up to 6,000 cy of additional soil and sediment generated from off-site remediation performed concurrently with the on-site remediation can be accommodated beneath the composite cap.

3) The remediated soils and sediment can be filled in a controlled manner that will create a stable containment cell.

4) The composite cap will be capable of shedding precipitation falling on the containment cell area therefore preventing infiltration and reducing the potential for migration of constituents of concern into groundwater.

5) Alternative 3A can achieve steeper finished slopes which increase capacity of the containment cell and if necessary slopes as steep as 33% may be achieved through proper design that can further increase available capacity.

6) Maintenance of the vegetative cover is an activity that can be easily implemented using local contractors or facility maintenance personnel and monitoring of the integrity of the surface can be performed through visual observations.

Alternative 4

1) On-site demolition debris and rubble not acceptable for use as excavation backfill on-site is readily disposed off-site at an appropriately permitted landfill.

2) Remediation of off-site properties can occur after completion of on-site remediation.

3) Off-site disposal can be utilized in conjunction with the on-site containment option.

The combined cost of Alternatives 2 ($1,360,690), 3A ($401,936) and partial use of 4 ($227,258) (assuming 4,638 cy of soil sent for off-site disposal and no stabilization) is $1,989,885. This includes long-term operation and maintenance for the cap at present worth.

For groundwater we are recommending Alternative 3 Source Removal with restriction of future site upper and middle site aquifer groundwater use to non-potable industrial, which is achieved through implementation of Alternative 2 for Soil and Sediment, and Alternative 4 Monitored Natural Attenuation. The following considerations were critical in selection of the recommended alternatives.

Alternative 3

1) Source removal is already being achieved through soil remediation selected for soil and sediment.

2) It will effectively remove the source for arsenic and lead in groundwater.

3) Soil to groundwater modeling shows that the concentrations of lead and arsenic remaining in soil will be less than the concentrations where groundwater would be above the MCL (arsenic) or IDEM Industrial default groundwater concentrations (lead).

4) This alternative does not add to the cost for clean up as the money is already being spent to address soil and sediment exposure issues.

Alternative 4

1) Monitored Natural Attenuation is being performed to confirm that source removal has a beneficial impact on groundwater concentrations and levels will decrease over time.

8.0 PROJECT SCHEDULE

It is the desire of Refined to coordinate preparation and implementation of the Corrective Measures with closure of the SWMUs currently being administered by IDEM. To fulfill that objective, Refined is prepared to contact IDEM and discuss the acceptability of soil excavation and on-site containment. Prior to contacting IDEM, Refined is awaiting USEPA concurrence with the recommended alternative. Once received, Refined will meet with IDEM to review the proposed Corrective Measures and inclusion of closure of the SWMUs. Refined requests USEPA involvement in that process.

After acceptance by IDEM, Refined will prepare the draft Corrective Measures Implementation Program (CMI) Plan as required under the Consent Decree. The CMI Plan will be submitted within 60 days of USEPA approval of this Phase II CMS Report. The CMI Plan will include Drawings, Specifications, Schedule and a Construction Quality Assurance Plan (CQAP), as specified in the Consent Decree.

TABLES

TABLE 1
SOIL AND SEDIMENT LEAD AND ARSENIC RESULTS
RMC Beech Grove
Beech Grove, Indiana

LOCATION	DEPTH	MATRIX	DATE COLLECTED	LEAD (mg/kg) RESULT	Q	DL	ARSENIC (mg/kg) RESULT	Q	DL
BSB1A	0-3"	Soil	8/26/1999	158		0.6	5.5		1
BSB1B	3-10"	Soil	8/26/1999	63		0.6	5.9		1
BSB1C	24-30"	Soil	8/26/1999	262		0.6	10		1
BSB2A	0-3"	Soil	8/26/1999	1,200		0.6	13		1
BSB2B	3-10"	Soil	8/26/1999	74		0.6	5.1		1
BSB3A	0-3"	Soil	8/26/1999	257		0.6	7		1
BSB3B	3-10"	Soil	8/26/1999	20		0.6	5.4		1
BSB4A	0-3"	Soil	8/26/1999	1,060		0.6	16		1
BSB4B	3-10"	Soil	8/26/1999	690		0.6	12		1
CSB1A	0-3"	Soil	8/17/1999	139,000	J	0.6	406	J	1
CSB-1A-A	0-3"	Soil	12/14/2001	903		32	3.2		1
CSB-1A-B	6-9"	Soil	12/14/2001	18		0.6	1.5		1
CSB-1A-C	12-15"	Soil	12/14/2001	44		0.6	1.5		1
CSB-1A-D	24-27"	Soil	12/14/2001	249,000		6,250	989		13
CSB-1A-E	36-39"	Soil	12/14/2001	847		13	6.8		1
CSB-1A-F	48-51"	Soil	12/14/2001	170		2.5	8.5		1
CSB-1A-G	60-63"	Soil	12/14/2001	65		1	5.6		1
CSB-1A-H	72-75"	Soil	12/14/2001	82		1	6		1
CSB-1A-I	84-87"	Soil	12/14/2001	47		0.6	5.7		1
CSB-1A-J	96-99"	Soil	12/14/2001	144		2.5	5.7		1
CSB1B	6-9"	Soil	8/17/1999	268,000	J	0.6	599	J	1
CSB1C	12-15"	Soil	8/17/1999	511	J	0.6	8	J	1
CSB2A	0-3"	Soil	8/17/1999	175,000		0.6	266		1
CSB2B	6-9"	Soil	8/17/1999	58,400		0.6	159		1
CSB2C	12-15"	Soil	8/17/1999	180,000		0.6	469		1
CSB-2-D	24-27	Soil	1/25/2007	72,000	U	2,000	180	UJ	0.5
CSB-2-E	36-39	Soil	1/25/2007	750	UJ	20	13	UJ	0.1
CSB-2-F	48-51	Soil	1/25/2007	820	U	20	11	UJ	0.1
CSB-2-G	60-63	Soil	1/25/2007	1,900		100		NA	
CSB-2-H	72-75	Soil	1/25/2007	18		1		NA	
CSB3A	0-3"	Soil	8/17/1999	121,000	J	0.6	284	J	1
CSB3B	6-9"	Soil	8/17/1999	150,000	J	0.6	565	J	1
CSB3C	12-15"	Soil	8/17/1999	78,100	J	0.6	217	J	1
CSB3D	24-28"	Soil	8/17/1999	93,900	J	0.6	193	J	1
CSB3E	36-39"	Soil	8/17/1999	232	J	0.6	12	J	1
CSB-3-F	48-51	Soil	1/25/2007		NA		6.4	UJ	0.1
CSB-3-G	60-63	Soil	1/25/2007	65	U	2	4.4	UJ	0.1
CSB4A	0-3"	Soil	8/17/1999	192,000	J	0.6	690	J	1
CSB4B	6-9"	Soil	8/17/1999	460,000	J	0.6	164	J	1
CSB4C	12-15"	Soil	8/17/1999	65	U	0.6	6.8	J	1
CSB5A	0-3"	Soil	8/17/1999	125	J	0.6	7.2		1
CSB5B	6-9"	Soil	8/17/1999	67	U	0.6	7.1		1
CSB5C	12-15"	Soil	8/17/1999	42	U	0.6	5.1		1
CSB6A	0-3"	Soil	8/17/1999	165	J	0.6	8.9		1
CSB6B	6-9"	Soil	8/17/1999	50	U	0.6	9.6		1
CSB6C	12-15"	Soil	8/17/1999	69	U	0.6	11		1
CSB7A	0-3"	Soil	8/17/1999	255,000	J	0.6	81		1
CSB7B	6-9"	Soil	8/17/1999	154,000	J	0.6	788		1
CSB7C	12-15"	Soil	8/17/1999	77,200	J	0.6	343		1
CSB7D	24-28"	Soil	8/17/1999	114		0.6	6.9		1
CSB7E	36-39"	Soil	8/17/1999	19	U	0.6	6.2		1
CSB8A	0-3"	Soil	8/19/1999	83,800		0.6	66		1
CSB8B	6-9"	Soil	8/19/1999	989		0.6	10		1
CSB8C	12-15"	Soil	8/19/1999	279		0.6	10		1
CSB9A	0-3"	Soil	8/17/1999	289		0.6	12		1
CSB9B	6-9"	Soil	8/17/1999	132		0.6	11		1

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Beech Grove, Indiana

LOCATION	DEPTH	MATRIX	DATE COLLECTED	LEAD (mg/kg)			ARSENIC (mg/kg)		
				RESULT	Q	DL	RESULT	Q	DL
CSB9C	12-15"	Soil	8/17/1999	53	U	0.6	7.7		1
CSB10A	0-3"	Soil	8/17/1999	132,000	J	0.6	709	J	1
CSB-10A-A	0-3"	Soil	12/14/2001	1,780		63	4.5		1
CSB-10A-B	6-9"	Soil	12/14/2001	1,210		32	6.1		1
CSB-10A-C	12-15"	Soil	12/14/2001	256,000	J	6,250	433		6.25
CSB-10A-D	24-27"	Soil	12/14/2001	475,000		12,500	2,730		63
CSB-10A-E	36-39"	Soil	12/14/2001	253		6.3	7.1	J	1
CSB-10A-F	48-51"	Soil	12/14/2001	288,000		5,000	1,700		50
CSB-10A-G	60-63"	Soil	12/14/2001	1,090		25	28		1
CSB-10A-H	72-75"	Soil	12/14/2001	101	J	2.5	11		1
CSB-10A-I	84-87"	Soil	12/14/2001	365		5	44		1
CSB-10-J	96-99	Soil	1/23/2007		NA		13		0.1
CSB-10-K	108-111	Soil	1/23/2007		NA		5.8		0.1
CSB-10-L	120-123	Soil	1/23/2007		NA		6.7		0.1
CSB10B	6-9"	Soil	8/17/1999	236,000	J	0.6	916	J	1
CSB10C	12-15"	Soil	8/17/1999	1,500	J	0.6	17	J	1
CSB10D	24-27"	Soil	8/17/1999	548	J	0.6	6.9	J	1
CSB11A	0-3"	Soil	8/17/1999	104,000	J	0.6	237	J	1
CSB11B	6-9"	Soil	8/17/1999	351,000	J	0.6	585	J	1
CSB11C	12-15"	Soil	8/17/1999	522	J	0.6	14	J	1
CSB-11-D	24-27	Soil	1/25/2007	58,000	U	2,000	680	J	2
CSB-11-E	36-39	Soil	1/25/2007	280	U	10	8.2	UJ	0.1
CSB-11-F	48-51	Soil	1/25/2007	43	U	2	6.8	UJ	0.1
CSB12A	0-3"	Soil	8/17/1999	467,000	J	0.6	1,050	J	1
CSB12B	6-9"	Soil	8/17/1999	372,000	J	0.6	2,270	J	1
CSB12C	12-15"	Soil	8/17/1999	353	J	0.6	14	J	1
CSB-12-D	24-27	Soil	1/23/2007		NA		970		5
CSB-12-E	36-39	Soil	1/23/2007		NA		200		1
CSB-12-F	48-51	Soil	1/23/2007		NA		14		0.1
CSB-12-G	60-63	Soil	1/23/2007		NA		7.2		0.1
CSB-12-H	72-75	Soil	1/23/2007		NA		22		0.1
CSB-12-I	84-87	Soil	1/23/2007		NA		13		0.1
CSB-12-J	96-99	Soil	1/23/2007		NA		14		0.1
CSB-12-K	108-111	Soil	1/23/2007		NA		8.4		0.1
CSB13A	0-3"	Soil	8/17/1999	323		0.6	38		1
CSB-13A-A	0-3"	Soil	12/14/2001	2,300		63	11		1
CSB-13A-B	6-9"	Soil	12/14/2001	1,070		13	22		1
CSB-13A-C	12-15"	Soil	12/14/2001	75		1.3	6.6		1
CSB-13A-D	24-27"	Soil	12/14/2001	39		0.6	5.9		1
CSB-13A-E	36-39"	Soil	12/14/2001	27		0.6	6		1
CSB13B	6-9"	Soil	8/17/1999	30	U	0.6	11		1
CSB13C	12-15"	Soil	8/17/1999	49	U	0.6	10		1
CSB14A	0-3"	Soil	8/19/1999	28	U	0.6	2.2		1
CSB14B	6-9"	Soil	8/19/1999	9.8	U	0.6	5.7		1
CSB14C	12-15"	Soil	8/19/1999	18	U	0.6	6.4		1
CSB15A	0-3"	Soil	8/19/1999	9.6	U	0.6	7		1
CSB15B	6-9"	Soil	8/19/1999	89		0.6	7.8		1
CSB15C	12-15"	Soil	8/19/1999	28		0.6	5.3		1
CSB16A	0-3"	Soil	8/19/1999	209	J	0.6	6		1
CSB16B	6-9"	Soil	8/19/1999	195	J	0.6	7.2		1
CSB16C	12-15"	Soil	8/19/1999	234	J	0.6	7.5		1
CSB17A	0-3"	Soil	8/19/1999	87	J	0.6	7.3		1
CSB17B	6-9"	Soil	8/19/1999	20	J	0.6	7.1		1
CSB17C	12-15"	Soil	8/19/1999	101	J	0.6	6.9		1
CSB18A	0-3"	Soil	8/23/1999	70	J	0.6	7.8		1
CSB18B	6-9"	Soil	8/23/1999	26	J	0.6	6		1

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LOCATION	DEPTH	MATRIX	DATE COLLECTED	LEAD (mg/kg)			ARSENIC (mg/kg)		
				RESULT	Q	DL	RESULT	Q	DL
CSB18C	12-15"	Soil	8/23/1999	38	J	0.6	8.3		1
CSB19A	0-3"	Soil	8/23/1999	187	J	0.6	9		1
CSB19B	6-9"	Soil	8/23/1999	79	J	0.6	6.8		1
CSB19C	12-15"	Soil	8/23/1999	129	J	0.6	6.7		1
CSB20A	0-3"	Soil	8/19/1999	30	J	0.6	9.6		1
CSB20B	6-9"	Soil	8/19/1999	19	U	0.6	6.9		1
CSB20C	12-15"	Soil	8/19/1999	23	J	0.6	2.4		1
CSB21A	0-3"	Soil	8/23/1999	31	J	0.6	7.8	J	1
CSB21B	6-9"	Soil	8/23/1999	329	J	0.6	9.3	J	1
CSB21C	12-15"	Soil	8/23/1999	32	J	0.6	6.8	J	1
CSB22A	0-3"	Soil	8/24/1999	8	J	0.6	6.3	J	1
CSB22B	6-9"	Soil	8/24/1999	7.7	J	0.6	6.7	J	1
CSB22C	12-15"	Soil	8/24/1999	9.8	J	0.6	6.6	J	1
CSB23A	0-3"	Soil	8/24/1999	10	J	0.6	7.5	J	1
CSB23B	6-9"	Soil	8/24/1999	11	J	0.6	7	J	1
CSB23C	12-15"	Soil	8/24/1999	32	J	0.6	6.2	J	1
CSB24A	0-3"	Soil	8/24/1999	28	J	0.6	4.8	J	1
CSB24B	6-9"	Soil	8/24/1999	20	J	0.6	9.3	J	1
CSB24C	12-15"	Soil	8/24/1999	12	J	0.6	4.4	J	1
CSB25A	0-3"	Soil	8/23/1999	411	J	0.6	13		1
CSB25B	6-9"	Soil	8/23/1999	2,420	J	0.6	75		1
CSB25C	12-15"	Soil	8/23/1999	108	J	0.6	8.8		1
CSB26A	0-3"	Soil	8/23/1999	191	J	0.6	7.7		1
CSB-26A-A	0-3"	Soil	12/14/2001	174		3.2	12		1
CSB-26A-B	6-9"	Soil	12/14/2001	88		1.3	11		1
CSB-26A-C	12-15"	Soil	12/14/2001	40		0.6	6.4		1
CSB-26A-D	24-27"	Soil	12/14/2001	25		0.6	6.2		1
CSB-26A-E	36-39"	Soil	12/14/2001	23		0.6	5.8		1
CSB26B	6-9"	Soil	8/23/1999	73	U	0.6	6.5		1
CSB26C	12-15"	Soil	8/23/1999	583	J	0.6	8.6		1
CSB27A	0-3"	Soil	8/23/1999	22	J	0.6	6.3		1
CSB27B	6-9"	Soil	8/23/1999	13	J	0.6	8.5		1
CSB27C	12-15"	Soil	8/23/1999	14	J	0.6	6.4		1
CSB28A	0-3"	Soil	8/23/1999	14	J	0.6	4.4	J	1
CSB-28A-A	0-3"	Soil	12/14/2001	30		0.6	53		1
CSB-28A-B	6-9"	Soil	12/14/2001	13		0.6	5.1		1
CSB-28A-C	12-15"	Soil	12/14/2001	27	J	0.6	7.9		1
CSB-28A-D	24-27"	Soil	12/14/2001	14		0.6	6.5		1
CSB-28A-E	36-39"	Soil	12/14/2001	16		0.6	9.4		1
CSB28B	6-9"	Soil	8/23/1999	19	J	0.6	10	J	1
CSB28C	12-15"	Soil	8/23/1999	29	J	0.6	23	J	1
CSB-28-D	24-27	Soil	1/24/2007		NA		8.2		0.1
CSB-28-E	36-39	Soil	1/24/2007	15	U	1	13		0.1
CSB29A	0-3"	Soil	8/23/1999	32	J	0.6	9.2	J	1
CSB29B	6-9"	Soil	8/23/1999	44	J	0.6	25	J	1
CSB29C	12-15"	Soil	8/23/1999	36	J	0.6	11	J	1
CSB30A	0-3"	Soil	8/23/1999	16	J	0.6	9.5		1
CSB-30A-A	0-3"	Soil	12/14/2001	2,360		63	30	J	1
CSB-30A-B	6-9"	Soil	12/14/2001	366		6.3	13	J	1
CSB-30A-C	12-15"	Soil	12/14/2001	243		6.3	9.1	J	1
CSB-30A-D	24-27"	Soil	12/14/2001	32		0.6	6.6	J	1
CSB-30A-E	36-39"	Soil	12/14/2001	13	U	0.6	6.6	J	1
CSB30B	6-9"	Soil	8/23/1999	13	J	0.6	6.7		1
CSB30C	12-15"	Soil	8/23/1999	15	J	0.6	11		1
CSB31A	0-3"	Soil	8/23/1999	431	J	0.6	14		1
CSB31B	6-9"	Soil	8/23/1999	2,280	J	0.6	22		1

TABLE 1
SOIL AND SEDIMENT LEAD AND ARSENIC RESULTS
RMC Beech Grove
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LOCATION	DEPTH	MATRIX	DATE COLLECTED	LEAD (mg/kg)			ARSENIC (mg/kg)		
				RESULT	Q	DL	RESULT	Q	DL
CSB31C	12-15"	Soil	8/23/1999	10		0.6	6.7	J	1
CSB32A	0-3"	Soil	8/23/1999	42,800	J	0.6	388		1
CSB-32A-A	0-3"	Soil	12/14/2001	164,000		6,250	394		6.3
CSB-32A-B	6-9"	Soil	12/14/2001	90,100		3,130	199		3.2
CSB-32A-C	12-15"	Soil	12/14/2001	64,000		6,250	230		3.2
CSB-32A-D	24-27"	Soil	12/14/2001	40		0.6	8	J	1
CSB-32A-E	36-39"	Soil	12/14/2001	20	U	0.6	6.5	J	1
CSB32B	6-9"	Soil	8/23/1999	403	J	0.6	7.4		1
CSB32C	12-15"	Soil	8/23/1999	694	J	0.6	7		1
CSB33A	0-3"	Soil	8/20/1999	196		0.6	13		1
CSB33B	6-9"	Soil	8/20/1999	868		0.6	12		1
CSB33C	12-15"	Soil	8/20/1999	245		0.6	13		1
CSB-33-D	24-27	Soil	1/24/2007		NA		8.9		0.1
CSB-33-E	36-39	Soil	1/24/2007		NA		7.1		0.1
CSB-33-F	48-51	Soil	1/24/2007	18	U	1	7.3	J	0.1
CSB34A	0-3"	Soil	8/20/1999	94,500		0.6	189		1
CSB34B	6-9"	Soil	8/20/1999	2,360		0.6	9.1		1
CSB34C	12-15"	Soil	8/20/1999	68		0.6	7		1
CSB35A	0-3"	Soil	8/20/1999	3,090		0.6	8.4		1
CSB-35A-A	0-3"	Soil	12/14/2001	70,400		1,250	154		6.3
CSB-35A-B	6-9"	Soil	12/14/2001	279		6.3	6.1		1
CSB-35A-C	12-15"	Soil	12/14/2001	350,000		6,250	408		13
CSB-35A-D	24-27"	Soil	12/14/2001	285		6.3	6		1
CSB-35A-E	36-39"	Soil	12/14/2001	499		13	6.3		1
CSB-35A-F	48-51"	Soil	12/14/2001	69		1.3	6.3		1
CSB-35A-G	60-63"	Soil	12/14/2001	156		3.2	6.6		1
CSB-35A-H	72-75"	Soil	12/14/2001	1,520	J	32	8.1		1
CSB-35A-I	84-87"	Soil	12/14/2001	11		0.6	5.9		1
CSB-35A-J	96-99"	Soil	12/14/2001	11		0.6	4.1		1
CSB35B	6-9"	Soil	8/20/1999	518	J	0.6	9.5		1
CSB35C	12-15"	Soil	8/20/1999	1,400	J	0.6	7		1
CSB35D	24-28"	Soil	8/20/1999	10,800		0.6	12		1
CSB35E	36-39"	Soil	8/20/1999	4,910		0.6	15		1
CSB35F	48-51"	Soil	8/20/1999	3,010		0.6	12		1
CSB36A	0-3"	Soil	8/20/1999	103		0.6	170		1
CSB36B	6-9"	Soil	8/20/1999	76		0.6	15		1
CSB36C	12-15"	Soil	8/20/1999	67		0.6	12		1
CSB37A	0-3"	Soil	8/20/1999	325	J	0.6	30		1
CSB37B	6-9"	Soil	8/20/1999	314	J	0.6	7.9		1
CSB37C	12-15"	Soil	8/20/1999	242	J	0.6	6.8		1
CSB38A	0-3"	Soil	8/20/1999	22	J	0.6	4.9	J	1
CSB-38A-A	0-3"	Soil	12/14/2001	6,200		125	67		6.3
CSB-38A-B	6-9"	Soil	12/14/2001	14		0.6	7.9		1
CSB-38A-C	12-15"	Soil	12/14/2001	22		0.6	9.3		1
CSB-38A-D	24-27"	Soil	12/14/2001	12		0.6	2.5		1
CSB-38A-E	36-39"	Soil	12/14/2001	319		6.3	8.6		1
CSB-38A-F	48-51	Soil	1/24/2007		NA		7.9		0.1
CSB-38A-G	60-63	Soil	1/24/2007		NA		9.5		0.1
CSB38B	6-9"	Soil	8/20/1999	15	U	0.6	4.4		1
CSB38C	12-15"	Soil	8/20/1999	19	U	0.6	7.8		1
CSB-38-D	24-27	Soil	1/24/2007		NA		7.7		0.1
CSB-38-E	36-39	Soil	1/24/2007		NA		6.3		0.1
CSB-38-F	48-51	Soil	1/24/2007		NA		6.8		0.1
CSB39A	0-3"	Soil	8/20/1999	46,800	J	0.6	863	J	1
CSB39B	6-9"	Soil	8/20/1999	69	J	0.6	8	J	1
CSB39C	12-15"	Soil	8/20/1999	15	U	0.6	5.8	J	1

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LOCATION	DEPTH	MATRIX	DATE COLLECTED	LEAD (mg/kg)			ARSENIC (mg/kg)		
				RESULT	Q	DL	RESULT	Q	DL
CSB40A	0-3"	Soil	8/20/1999	6,660	J	0.6	39	J	1
CSB40B	6-9"	Soil	8/20/1999	20	U	0.6	6.4	J	1
CSB40C	12-15"	Soil	8/20/1999	14	U	0.6	11	J	1
CSB41A	0-3"	Soil	8/20/1999	45	J	0.6	4.8	J	1
CSB41B	6-9"	Soil	8/20/1999	8.9	U	0.6	7.6	J	1
CSB41C	12-15"	Soil	8/20/1999	8.8	U	0.6	6.3	J	1
CSB42A	0-3"	Soil	8/20/1999	11	U	0.6	23		1
CSB42B	6-9"	Soil	8/20/1999	11	U	0.6	73		1
CSB42C	12-15"	Soil	8/20/1999	15	U	0.6	7.8		1
CSB43A	0-3"	Soil	8/25/1999	14	J	0.6	10		1
CSB43B	6-9"	Soil	8/25/1999	106	J	0.6	9.3		1
CSB43C	12-15"	Soil	8/25/1999	24	J	0.6	6.6		1
CSB44A	0-3"	Soil	8/25/1999	32	J	0.6	7.8		1
CSB44B	6-9"	Soil	8/25/1999	12	J	0.6	7.2		1
CSB44C	12-15"	Soil	8/25/1999	20	J	0.6	7.6		1
CSB45A	0-3"	Soil	8/25/1999	27		0.6	7.9		1
CSB45B	6-9"	Soil	8/25/1999	12		0.6	10		1
CSB45C	12-15"	Soil	8/25/1999	9.9	U	0.6	7.2		1
CSB46A	0-3"	Soil	8/25/1999	12	J	0.6	8.9		1
CSB46B	6-9"	Soil	8/25/1999	12	J	0.6	6.9		1
CSB46C	12-15"	Soil	8/25/1999	9.7	J	0.6	9.1		1
CSB47A	0-3"	Soil	8/25/1999	58		0.6	25		1
CSB47B	6-9"	Soil	8/25/1999	11	U	0.6	6.8		1
CSB47C	12-15"	Soil	8/25/1999	10	U	0.6	5.9		1
CSB49A	0-3"	Soil	8/20/1999	147		0.6	8.1		1
CSB49B	6-9"	Soil	8/20/1999	18	U	0.6	6.4		1
CSB49C	12-15"	Soil	8/20/1999	17	U	0.6	6.8		1
CSB50A	0-3"	Soil	8/23/1999	480	J	0.6	15		1
CSB50B	6-9"	Soil	8/23/1999	131	J	0.6	13		1
CSB50C	12-15"	Soil	8/23/1999	229	J	0.6	10		1
CSB51A	0-3"	Soil	8/20/1999	47,300		0.6	265		1
CSB51B	6-9"	Soil	8/20/1999	10,300		0.6	187		1
CSB51C	12-15"	Soil	8/20/1999	5,680		0.6	17		1
CSB51D	24-28"	Soil	8/20/1999	18,700		0.6	36		1
CSB51E	36-39"	Soil	8/20/1999	12,000		0.6	26		1
CSB51F	48-51"	Soil	8/20/1999	8,020		0.6	18		1
CSB51G	60-63"	Soil	8/20/1999	3,800		0.6	15		1
CSB-51-H	72-75	Soil	1/24/2007	16	U	1	7		0.1
CSB-51-I	84-87	Soil	1/24/2007	15	U	1	9.6		0.1
CSB-51-J	96-99	Soil	1/24/2007	12	U	1	7.2		0.1
CSED1A	0-3"	Sediment	8/25/1999	43,900		0.6	653		1
CSED2A	0-3"	Sediment	8/25/1999	138,000		0.6	229		1
CSED3A	0-3"	Sediment	8/25/1999	161,000		0.6	368		1
CSED4A	0-3"	Sediment	8/25/1999	7,390		0.6	189		1
CSED4B	0-3"	Sediment	8/25/1999	11,000		0.6	182		1
R2SB-1A	0-3"	Soil	8/23/2001	1,750		25	141		3.2
R2SB-1A-A	0-3"	Soil	12/13/2001	2,250		32	58	J	1
R2SB-1A-B	6-9"	Soil	12/13/2001	609		6.3	7.6	J	1
R2SB-1A-C	12-15"	Soil	12/13/2001	4,230		32	7.8	J	1
R2SB-1B	3-10"	Soil	8/23/2001	1,080		25	50		1
R2SB-2A	0-3"	Soil	8/23/2001	1,290	J	25	19		1
R2SB-2A-A	0-3"	Soil	12/13/2001	918		13	16	J	1
R2SB-2A-B	6-9"	Soil	12/13/2001	4,120		63	15	J	1
R2SB-2A-C	12-15"	Soil	12/13/2001	816		6.3	4.6	J	1
R2SB-2B	3-10"	Soil	8/23/2001	2,760	J	63	10		1
R2SB-3A	0-3"	Soil	8/23/2001	991	J	13	38		1

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LOCATION	DEPTH	MATRIX	DATE COLLECTED	LEAD (mg/kg)			ARSENIC (mg/kg)		
				RESULT	Q	DL	RESULT	Q	DL
R2SB-3A-A	0-3"	Soil	12/13/2001	1,620		32	36	J	1
R2SB-3A-B	6-9"	Soil	12/13/2001	1,410		32	19		3.1
R2SB-3A-C	12-15"	Soil	12/13/2001	1,330		32	6.3	J	1
R2SB-3B	3-10"	Soil	8/23/2001	1,760	J	25	10		1
R2SB-4A	0-3"	Soil	8/23/2001	1,980	J	25	26		1
R2SB-4A-A	0-3"	Soil	12/13/2001	2,490		63	28	J	1
R2SB-4A-B	6-9"	Soil	12/13/2001	874		13	13	J	1
R2SB-4A-C	12-15"	Soil	12/13/2001	1,420		32	18	J	1
R2SB-4B	3-10"	Soil	8/23/2001	1,380	J	25	12		1
R2SB-5A	0-3"	Soil	8/23/2001	121	J	3.2	10	J	1
R2SB-5B	3-10"	Soil	8/23/2001	68	J	1.3	5.5	J	1
R2SB-6A	0-3"	Soil	8/23/2001	587	J	6.3	12		1
R2SB-6B	3-10"	Soil	8/23/2001	286	J	3.2	11		1
R2SB-7A	0-3"	Soil	8/23/2001	78	J	1.3	9.6		1
R2SB-7B	3-10"	Soil	8/23/2001	35		0.6	13		1
R2SB-8A	0-3"	Soil	8/23/2001	197		3.2	13		1
R2SB-8B	3-10"	Soil	8/23/2001	51		0.6	8.4		1
R2SB-9A	0-3"	Soil	8/23/2001	3,330		63	47		1
R2SB-9B	3-10"	Soil	8/23/2001	287		6.3	12		1
R2SB-10A	0-3"	Soil	8/23/2001	25	J	0.6	8.9	J	1
R2SB-10B	3-10"	Soil	8/23/2001	10		0.6	12		1
R2SB-11A	0-3"	Soil	8/23/2001	360	J	6.3	14	J	1
R2SB-11B	3-10"	Soil	8/23/2001	83	J	1.3	6.2	J	1
R2SB-12A	0-3"	Soil	8/23/2001	222	J	3.2	11	J	1
R2SB-12B	3-10"	Soil	8/23/2001	71	J	1.3	8.6	J	1
R2SB-13A	0-3"	Soil	8/23/2001	7,390		125	53		1
R2SB-13A-A	0-3"	Soil	12/13/2001	2,910		32	14	J	1
R2SB-13A-B	6-9"	Soil	12/13/2001	24		0.6	2.1	J	1
R2SB-13A-C	12-15"	Soil	12/13/2001	11		0.6	4.5	J	1
R2SB-13B	3-10"	Soil	8/23/2001	875		13	27		1
R2SB-14A	0-3"	Soil	8/23/2001	89	J	1.3	8.6	J	1
R2SB-14B	3-10"	Soil	8/23/2001	7.3		0.6	3.6		1
R2SB-15A	0-3"	Soil	8/23/2001	265	J	3.2	4.8	J	1
R2SB-15B	3-10"	Soil	8/23/2001	184	J	3.2	14	J	1
R2SB-16A	0-3"	Soil	8/23/2001	179	J	3.2	7.7	J	1
R2SB-16B	3-10"	Soil	8/23/2001	125	J	3.2	9	J	1
R2SB-17A	0-3"	Soil	8/23/2001	4,160		63	25		1
R2SB-17B	3-10"	Soil	8/23/2001	267		3.2	11		1
R2SB-18A	0-3"	Soil	8/23/2001	669	J	13	10	J	1
R2SB-18B	3-10"	Soil	8/23/2001	122	J	3.2	6.3	J	1
R2SB-19A	0-3"	Soil	8/23/2001	796	J	13	16	J	1
R2SB-19B	3-10"	Soil	8/23/2001	250	J	3.2	14	J	1
R2SB-20A	0-3"	Soil	8/23/2001	486	J	6.3	9.6	J	1
R2SB-20B	3-10"	Soil	8/23/2001	129	J	3.2	4.4	J	1
R2SB-21A	0-3"	Soil	8/23/2001	296		3.2	10		1
R2SB-21B	3-10"	Soil	8/23/2001	84		1.3	7		1
R2SB-22A	0-3"	Soil	8/23/2001	734		13	13		1
R2SB-22B	3-10"	Soil	8/23/2001	188		3.2	12		1
R2SB-23A	0-3"	Soil	8/23/2001	463		6.3	10		1
R2SB-23B	3-10"	Soil	8/23/2001	105	J	1.3	13		1
R2SB-24A	0-3"	Soil	8/23/2001	779		13	13		1
R2SB-24B	3-10"	Soil	8/23/2001	117		3.2	9.1		1
R2SB25-0-3	0-3"	Sediment	10/29/2003	617		60	23		1
R2SB25-3-10	3-10"	Sediment	10/29/2003	425		60	17		1
R2SB26-0-3	0-3"	Sediment	10/29/2003	12,200		1,200	169		25
R2SB26-3-10	3-10"	Sediment	10/29/2003	6,020		600	114		25

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LOCATION	DEPTH	MATRIX	DATE COLLECTED	LEAD (mg/kg)			ARSENIC (mg/kg)		
				RESULT	Q	DL	RESULT	Q	DL
R2SB27-0-3	0-3"	Sediment	10/29/2003	786		120	25		1
R2SB27-3-10	3-10"	Sediment	10/29/2003	658		120	35		1
R2SB28-0-3	0-3"	Sediment	10/29/2003	684		120	23		1
R2SB28-3-10	3-10"	Sediment	10/29/2003	403		60	20		1
R2SB29-0-3	0-3"	Sediment	10/29/2003	14,800		3,000	154		25
R2SB29-3-10	3-10"	Sediment	10/29/2003	15,700		3,000	216		25
R2SB30-0-3	0-3"	Sediment	10/29/2003	1,810		300	12		1
R2SB30-3-10	3-10"	Sediment	10/29/2003	479		60	9		1
R2SB-32A	0-3"	Soil	8/27/2001	286	J	6.3	4.9		1
R2SB-32B	3-10"	Soil	8/27/2001	91	J	1.3	4.2		1
R2SB-33A	0-3"	Soil	8/27/2001	202	J	3.2	6.3		1
R2SB-33B	3-10"	Soil	8/27/2001	67	J	1.3	5.7		1
R2SB-34A	0-3"	Soil	8/27/2001	170	J	3.2	7.1		1
R2SB-34B	3-10"	Soil	8/27/2001	28	J	0.6	4.1		1
R2SB-35A	0-3"	Soil	8/27/2001	191	J	3.2	3.7		1
R2SB-35B	3-10"	Soil	8/27/2001	79	J	1.3	4.7		1
R2SB-36A	0-3"	Soil	8/27/2001	310	J	6.3	7.8		1
R2SB-36B	3-10"	Soil	8/27/2001	109	J	3.2	6.1		1
R2SB-37A	0-3"	Soil	8/27/2001	366	J	6.3	9.2		1
R2SB-37B	3-10"	Soil	8/27/2001	509	J	6.3	8		1
R2SB-38A	0-3"	Soil	8/27/2001	282	J	6.3	6.5		1
R2SB-38B	3-10"	Soil	8/27/2001	175	J	3.2	5.2		1
R2SB-39A	0-3"	Soil	8/27/2001	383	J	6.3	8.7		1
R2SB-39B	3-10"	Soil	8/27/2001	144	J	3.2	7.9		1
R2SB-40A	0-3"	Soil	8/27/2001	422	J	6.3	6.9		1
R2SB-40B	3-10"	Soil	8/27/2001	50	J	0.6	4		1
R2SB-41A	0-3"	Soil	8/27/2001	172	J	3.2	5.9		1
R2SB-41B	3-10"	Soil	8/27/2001	128	J	3.2	5.9		1
R2SB-42A	0-3"	Soil	8/27/2001	165	J	3.2	4.2		1
R2SB-42B	3-10"	Soil	8/27/2001	77	J	1.3	3.9		1
R2SB-43A	0-3"	Soil	8/27/2001	250	J	3.2	7.4		1
R2SB-43B	3-10"	Soil	8/27/2001	201	J	3.2	7.4		1
R2SB-44A	0-3"	Soil	8/27/2001	252	J	3.2	7.8		1
R2SB-44B	3-10"	Soil	8/27/2001	108	J	3.2	8.5		1
R2SB-45A	0-3"	Soil	8/27/2001	140	J	3.2	7.3		1
R2SB-45B	3-10"	Soil	8/27/2001	85	J	1.3	6.2		1
R2SB-46-A	0-3"	Soil	9/24/2001	34		0.6	6.9	J	1
R2SB-46-B	3-10"	Soil	9/24/2001	41		0.6	6.5	J	1
R2SB-47-A	0-3"	Soil	9/24/2001	45		0.6	6.7	J	1
R2SB-47-B	3-10"	Soil	9/24/2001	24		0.6	9	J	1
R2SB-48-A	0-3"	Soil	9/24/2001	41		0.6	6.5	J	1
R2SB-48-B	3-10"	Soil	9/24/2001	45		0.6	6.7	J	1
R2SB-49-A	0-3"	Soil	9/24/2001	47		0.6	8	J	1
R2SB-49-B	3-10"	Soil	9/24/2001	117		3.2	9.7	J	1
R2SB-50-A	0-3"	Soil	9/24/2001	34		0.6	6.9	J	1
R2SB-50-B	3-10"	Soil	9/24/2001	36		0.6	7	J	1
R2SB-51-A	0-3"	Soil	12/12/2001	285	J	6.3	6.6		1
R2SB-51-B	6-9"	Soil	12/12/2001	199	J	6.3	7		1
R2SB-52-A	0-3"	Soil	12/13/2001	300		3.2	4.6	J	1
R2SB-52-B	6-9"	Soil	12/13/2001	5.7		0.6	3.3	J	1
R2SB-53-A	0-3"	Soil	12/13/2001	499		6.3	8.4	J	1
R2SB-53-B	6-9"	Soil	12/13/2001	58		0.6	3.3	J	1
R2SED-1A	0-6"	Sediment	8/21/2001	1,210	U	25	10		1
R2SED-1B	6-12"	Sediment	8/21/2001	1,550		25	14		1
R2SED-1C	12-18"	Sediment	12/12/2001	19	J	0.6	10		1
R2SED-1D	18-24"	Sediment	12/12/2001	62	J	0.6	5.5		1

TABLE 1
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LOCATION	DEPTH	MATRIX	DATE COLLECTED	LEAD (mg/kg) RESULT	Q	DL	ARSENIC (mg/kg) RESULT	Q	DL
R2SED-2A	0-6"	Sediment	8/21/2001	1,230	U	25	10		1
R2SED-2B	6-12"	Sediment	8/21/2001	955	U	25	11		1
R2SED-3A	0-6"	Sediment	8/21/2001	1,570		25	12		1
R2SED-3B	6-12"	Sediment	8/21/2001	6,020	U	125	9.3		1
R2SED-3C	12-18"	Sediment	12/12/2001	622	J	13	13		1
R2SED-3D	18-24"	Sediment	12/12/2001	691	J	13	12		1
R2SED-4A	0-6"	Sediment	8/21/2001	2,480	U	63	20		1
R2SED-4B	6-12"	Sediment	8/21/2001	1,570		25	17		1
R2SED-5A	0-6"	Sediment	8/21/2001	5,410		125	46		1
R2SED-5B	6-12"	Sediment	8/21/2001	1,240		25	20		1
R2SED-5C	12-18"	Sediment	12/12/2001	73	J	1.3	5.7		1
R2SED-5D	18-24"	Sediment	12/12/2001	20	J	0.6	7.3		1
R2SED-6A	0-6"	Sediment	8/21/2001	8,430		125	44		1
R2SED-6B	6-12"	Sediment	8/21/2001	3,840		63	35		1
R2SED-7A	0-6"	Sediment	8/21/2001	5,480		125	39		1
R2SED-7B	6-12"	Sediment	8/21/2001	2,340		63	26		1
R2SED-7C	12-18"	Sediment	12/12/2001	61	J	0.6	13		1
R2SED-7D	18-24"	Sediment	12/12/2001	27	J	0.6	9.2		1
R2SED-8A	0-6"	Sediment	8/21/2001	8,190		125	36		1
R2SED-8B	6-12"	Sediment	8/21/2001	2,610		63	23		1
R2SED-9A	0-6"	Sediment	8/21/2001	3,630		63	29		1
R2SED-9B	6-12"	Sediment	8/21/2001	471		6.3	11		1
R2SED-9C	12-18"	Sediment	12/12/2001	25	J	0.6	8.9		1
R2SED-9D	18-24"	Sediment	12/12/2001	39	J	0.6	8.2		1
R2SED-10A	0-6"	Sediment	8/21/2001	84		1.3	9.4		1
R2SED-10B	6-12"	Sediment	8/21/2001	25		0.6	7.2		1
R2SED-11-0-6	0-6"	Sediment	10/28/2003	874		120	12		1
R2SED-11-6-12	6-12"	Sediment	10/28/2003	1,470		300	15		1
R2SED-12-0-6	0-6"	Sediment	10/28/2003	411		60	11		1
R2SED-12-6-12	6-12"	Sediment	10/28/2003	32		0.6	9.3		1
R2SED-13-0-6	0-6"	Sediment	10/28/2003	771		120	12		1
R2SED-13-6-12	6-12"	Sediment	10/28/2003	28		0.6	8.3		1
R2SED-14-0-6	0-6"	Sediment	10/28/2003	681		60	11		1
R2SED-14-6-12	6-12"	Sediment	10/28/2003	24		0.6	9.5		1
RSB1A	0-3"	Soil	8/22/1999	873		0.6	11		1
RSB1B	3-10"	Soil	8/22/1999	215		0.6	6.2		1
RSB2A	0-3"	Soil	8/22/1999	1,100		0.6	14		1
RSB2B	3-10"	Soil	8/22/1999	202		0.6	6.6		1
RSB3A	0-3"	Soil	8/22/1999	632		0.6	9.1		1
RSB3B	3-10"	Soil	8/22/1999	593		0.6	7		1
RSB4A	0-3"	Soil	8/22/1999	2,360		0.6	22		1
RSB4B	3-10"	Soil	8/22/1999	686		0.6	9.8		1
RSB5A	0-3"	Soil	8/16/1999	985		0.6	10		1
RSB5B	3-10"	Soil	8/16/1999	366		0.6	7.5		1
RSB6A	0-3"	Soil	8/22/1999	1,880		0.6	22		1
RSB6B	3-10"	Soil	8/22/1999	289		0.6	9		1
RSB7A	0-3"	Soil	8/16/1999	1,150		0.6	14		1
RSB7B	3-10"	Soil	8/16/1999	232		0.6	6.8		1
RSB8A	0-3"	Soil	8/22/1999	1,050		0.6	23		1
RSB8B	3-10"	Soil	8/22/1999	321		0.6	9.1		1
RSB9A	0-3"	Soil	8/22/1999	14,500		0.6	96		1
RSB9B	3-10"	Soil	8/22/1999	3,800		0.6	27		1
RSB10A	0-3"	Soil	8/16/1999	1,850		0.6	14		1
RSB10B	3-10"	Soil	8/16/1999	241		0.6	6.6		1
RSB11A	0-3"	Soil	8/16/1999	641		0.6	13		1
RSB11B	3-10"	Soil	8/16/1999	101		0.6	5.1		1

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LOCATION	DEPTH	MATRIX	DATE COLLECTED	LEAD (mg/kg)			ARSENIC (mg/kg)		
				RESULT	Q	DL	RESULT	Q	DL
RSB12A	0-3"	Soil	8/11/1999	11,100		0.6	95		1
RSB12B	3-10"	Soil	8/11/1999	17,500		0.6	125		1
RSB13A	0-3"	Soil	8/16/1999	682		0.6	11		1
RSB13B	3-10"	Soil	8/16/1999	96		0.6	5	U	1
RSB14A	0-3"	Soil	8/24/1999	8,100		0.6	24		1
RSB14B	3-10"	Soil	8/24/1999	8,480		0.6	15		1
RSB15A	0-3"	Soil	8/19/1999	1,070	J	0.6	22	J	1
RSB15B	3-10"	Soil	8/19/1999	211	J	0.6	10	J	1
RSB16A	0-3"	Soil	8/16/1999	661		0.6	13		1
RSB16B	3-10"	Soil	8/16/1999	95		0.6	5.6	U	1
RSB17A	0-3"	Soil	8/24/1999	530		0.6	10		1
RSB17B	3-10"	Soil	8/24/1999	21		0.6	9.7		1
RSB-17-C	6-12	Soil	1/23/2007		NA		290		1
RSB-17-D	24-27	Soil	1/23/2007		NA		24		0.1
RSB-17-E	36-39	Soil	1/23/2007		NA		43		0.1
RSB-17-F	48-51	Soil	1/23/2007		NA		6		0.1
RSB18A	0-3"	Soil	8/24/1999	526		0.6	7.8		1
RSB18B	3-10"	Soil	8/24/1999	50		0.6	6.3		1
RSB19A	0-3"	Soil	8/19/1999	11	J	0.6	7	J	1
RSB19B	3-10"	Soil	8/19/1999	13	J	0.6	6.8	J	1
RSB20A	0-3"	Soil	8/10/1999	593		0.6	14		1
RSB20B	3-10"	Soil	8/10/1999	97		0.6	10		1
RSB21A	0-3"	Soil	8/16/1999	497		0.6	8.3		1
RSB21B	3-10"	Soil	8/16/1999	105		0.6	7.2		1
RSB22A	0-3"	Soil	8/24/1999	478		0.6	21		1
RSB22B	3-10"	Soil	8/24/1999	237		0.6	10		1
RSB23A	0-3"	Soil	8/11/1999	987		0.6	18	J	1
RSB23B	3-10"	Soil	8/11/1999	157		0.6	2.6	J	1
RSB24A	0-3"	Soil	8/10/1999	1,980		0.6	20		1
RSB24B	3-10"	Soil	8/10/1999	288		0.6	6.5		1
RSB25A	0-3"	Soil	8/24/1999	83,500		0.6	867		1
RSB25B	3-10"	Soil	8/24/1999	7,930		0.6	104		1
RSB26A	0-3"	Soil	8/24/1999	9,670		0.6	175	J	1
RSB26B	3-10"	Soil	8/24/1999	8,130		0.6	184		1
RSB-26-C	6-12	Soil	1/23/2007	24	U	1	9.8		0.1
RSB-26-D	24-27	Soil	1/23/2007	22	U	1	10		0.1
RSB27A	0-3"	Soil	8/19/1999	14	J	0.6	8.1	J	1
RSB27B	3-10"	Soil	8/19/1999	14	J	0.6	6.5	J	1
RSB28A	0-3"	Soil	8/10/1999	3,140		0.6	56		1
RSB28B	3-10"	Soil	8/10/1999	478		0.6	16		1
RSB29A	0-3"	Soil	8/10/1999	1,480		0.6	23		1
RSB29B	3-10"	Soil	8/10/1999	350		0.6	11		1
RSB30A	0-3"	Soil	8/10/1999	887		0.6	15		1
RSB30B	3-10"	Soil	8/10/1999	127		0.6	7.4		1
RSB31A	0-3"	Soil	8/11/1999	23,700		0.6	202	J	1
RSB31B	3-10"	Soil	8/11/1999	27,400		0.6	232	J	1
RSB32A	0-3"	Soil	8/24/1999	841		0.6	13	J	1
RSB32B	3-10"	Soil	8/24/1999	531		0.6	7.7	J	1
RSB33A	0-3"	Soil	8/24/1999	2,200		0.6	56	J	1
RSB33B	3-10"	Soil	8/24/1999	22		0.6	10	J	1
RSB34A	0-3"	Soil	8/19/1999	19	J	0.6	6.5	J	1
RSB34B	3-10"	Soil	8/19/1999	19	J	0.6	6.3	J	1
RSB35A	0-3"	Soil	8/24/1999	43		0.6	10		1
RSB35B	3-10"	Soil	8/24/1999	23		0.6	6.4		1
RSB36A	0-3"	Soil	8/10/1999	216		0.6	9.2		1
RSB36B	3-10"	Soil	8/10/1999	55		0.6	5.7		1

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LOCATION	DEPTH	MATRIX	DATE COLLECTED	LEAD (mg/kg)			ARSENIC (mg/kg)		
				RESULT	Q	DL	RESULT	Q	DL
RSB37A	0-3"	Soil	8/21/1999	679		0.6	17		1
RSB37B	3-10"	Soil	8/21/1999	594		0.6	13		1
RSB38A	0-3"	Soil	8/11/1999	2,000		0.6	14		1
RSB38B	3-10"	Soil	8/11/1999	440		0.6	7.2		1
RSB39A	0-3"	Soil	8/10/1999	227		0.6	10		1
RSB39B	3-10"	Soil	8/10/1999	81		0.6	7.6		1
RSB40A	0-3"	Soil	8/10/1999	901		0.6	19		1
RSB40B	3-10"	Soil	8/10/1999	161		0.6	7		1
RSB41A	0-3"	Soil	8/10/1999	341		0.6	10		1
RSB41B	3-10"	Soil	8/10/1999	82		0.6	5.7		1
RSB42A	0-3"	Soil	8/21/1999	834		0.6	15		1
RSB42B	3-10"	Soil	8/21/1999	214		0.6	7.3		1
RSB43A	0-3"	Soil	8/21/1999	1,130		0.6	20		1
RSB43B	3-10"	Soil	8/21/1999	230		0.6	11		1
RSB44A	0-3"	Soil	8/21/1999	369		0.6	9.5		1
RSB44B	3-10"	Soil	8/21/1999	53		0.6	8.9		1
RSB45A	0-3"	Soil	8/11/1999	487		0.6	6.1	J	1
RSB45B	3-10"	Soil	8/11/1999	234		0.6	10	J	1
RSB46A	0-3"	Soil	8/11/1999	385		0.6	3.9	J	1
RSB46B	3-10"	Soil	8/11/1999	216		0.6	5.4	J	1
RSB49A	0-3"	Soil	8/22/1999	1,060		0.6	20		1
RSB49B	3-10"	Soil	8/22/1999	663		0.6	1.4		1
RSB49C	24-30"	Soil	8/22/1999	186		0.6		U	1
RSB50A	0-3"	Soil	8/22/1999	5,470		0.6	38		1
RSB50B	3-10"	Soil	8/22/1999	888		0.6	9		1
RSB50C	24-30"	Soil	8/22/1999	873		0.6	12		1
RSB51A	0-3"	Soil	8/22/1999	12,600		0.6	169		1
RSB51B	3-10"	Soil	8/22/1999	4,430		0.6	77		1
RSB51C	24-30"	Soil	8/22/1999	3,300		0.6	43		1
RSB52A	0-3"	Soil	8/24/1999	25		0.6	6.6		1
RSB52B	3-10"	Soil	8/24/1999	77		0.6	5.9		1
RSB52C	24-30"	Soil	8/24/1999	67		0.6	6.9		1
RSB53A	0-3"	Soil	8/24/1999	21		0.6	8.2		1
RSB53B	3-10"	Soil	8/24/1999	18		0.6	8.3		1
RSB53C	24-30"	Soil	8/24/1999	17		0.6	6.9		1
RSB54A	0-3"	Soil	8/24/1999	22,800		0.6	107		1
RSB54B	3-10"	Soil	8/24/1999	17,300		0.6	94		1
RSB54C	24-30"	Soil	8/24/1999	151		0.6	3.4		1
RSB55A	0-3"	Soil	8/24/1999	27,400		0.6	323		1
RSB55B	3-10"	Soil	8/24/1999	27,000		0.6	359		1
RSB55C	24-30"	Soil	8/24/1999	13,100		0.6	60		1
RSB56A	0-3"	Soil	8/24/1999	30		0.6	8.6		1
RSB56B	3-10"	Soil	8/24/1999	27		0.6	7.7		1
RSB56C	24-30"	Soil	8/24/1999	88		0.6	6.1		1
RSB57A	0-3"	Soil	8/24/1999	17,000		0.6	235		1
RSB57B	3-10"	Soil	8/24/1999	17,400		0.6	127		1
RSB57C	24-30"	Soil	8/24/1999	3,850		0.6	16		1
RSB58A	0-3"	Soil	8/11/1999	32,000		0.6	247		1
RSB58B	3-10"	Soil	8/11/1999	21,000		0.6	200		1
RSB58C	24-30"	Soil	8/11/1999	11,100		0.6	37		1
RSB-63A	0-3"	Soil	9/20/1999	1,330		0.6	16	J	1
RSB-63B	3-10"	Soil	9/20/1999	131		0.6	3.4	J	1
RSB-64A	0-3"	Soil	9/20/1999	1,470		0.6	32	J	1
RSB-64B	3-10"	Soil	9/20/1999	214		0.6	9.8	J	1
RSB65A	0-3"	Soil	8/21/1999	126	J	0.6	7.3		1
RSB65B	3-10"	Soil	8/21/1999	13	J	0.6	6.6		1

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LOCATION	DEPTH	MATRIX	DATE COLLECTED	LEAD (mg/kg)			ARSENIC (mg/kg)		
				RESULT	Q	DL	RESULT	Q	DL
RSB66A	0-3"	Soil	8/21/1999	222	J	0.6	8.5		1
RSB66B	3-10"	Soil	8/21/1999	106	J	0.6	8.1		1
RSB67A	0-3"	Soil	8/21/1999	225	J	0.6	9.1		1
RSB67B	3-10"	Soil	8/21/1999	141	J	0.6	6.4		1
RSB68A	0-3"	Soil	8/21/1999	201	J	0.6	7.3		1
RSB68B	3-10"	Soil	8/21/1999	128	J	0.6	6.7		1
RSB-69A	0-3"	Soil	9/20/1999	2,750		0.6	55	J	1
RSB-69B	3-10"	Soil	9/20/1999	678		0.6	13	J	1
RSB-69C	24-30"	Soil	9/20/1999	54		0.6	5.6	J	1
RSB-70A	0-3"	Soil	9/20/1999	6,420		0.6	212	J	1
RSB-70B	3-10"	Soil	9/20/1999	13,100		0.6	323	J	1
RSB-70C	24-30"	Soil	9/20/1999	11		0.6	5.5	J	1
RSB71A	0-3"	Soil	8/21/1999	66,800		0.6	215		1
RSB72A	0-3"	Soil	8/21/1999	34	U	0.6	8.7		1
RSB72B	3-10"	Soil	8/21/1999	15	U	0.6	7		1
RSB72C	24-30"	Soil	8/21/1999	15	U	0.6	8.2		1
RSB73A	0-3"	Soil	8/21/1999	6,710		0.6	18		1
RSB73B	3-10"	Soil	8/21/1999	145	J	0.6	11		1
RSB73C	24-30"	Soil	8/21/1999	178		0.6	7.6		1
RSB74A	0-3"	Soil	8/19/1999	380	J	0.6	13	J	1
RSB74B	3-10"	Soil	8/19/1999	177	J	0.6	9	J	1
RSB74C	24-30"	Soil	8/19/1999	75	J	0.6	4.9	J	1
RSB75A	0-3"	Soil	8/19/1999	3,220	J	0.6	58	J	1
RSB75B	3-10"	Soil	8/19/1999	1,500	J	0.6	15	J	1
RSB75C	24-30"	Soil	8/19/1999	962	J	0.6	12	J	1
RSB-75-E	36-39	Soil	1/24/2007	14	U	1	7.5		0.1
RSB-75-F	48-51	Soil	1/24/2007	8.7	U	1	6.6		0.1
RSB76A	0-3"	Soil	8/19/1999	4.7	U	0.6	24	J	1
RSB76B	3-10"	Soil	8/19/1999	648	J	0.6	10	J	1
RSB76C	24-30"	Soil	8/19/1999	72	J	0.6	7.7	J	1
RSB77A	0-3"	Soil	8/20/1999	10700	J	0.6	7		1
RSB77B	3-10"	Soil	8/20/1999	2,920	J	0.6	7.7		1
RSB77C	24-30"	Soil	8/20/1999	232	J	0.6	6.6		1
RSB78A	0-3"	Soil	8/23/1999	3,060		0.6	14		1
RSB78B	3-10"	Soil	8/23/1999	2,600		0.6	12		1
RSB78C	24-30"	Soil	8/23/1999	2,960		0.6	13		1
RSB-78-E	36-39	Soil	1/24/2007	110	U	5	5.7		0.1
RSB-78-F	48-51	Soil	1/24/2007	88	U	5	7.8		0.1
RSB79A	0-3"	Soil	8/23/1999	57	J	0.6	8.5	J	1
RSB79B	3-10"	Soil	8/23/1999	205	J	0.6	6.9	J	1
RSB79C	24-30"	Soil	8/23/1999	164	J	0.6	8.1	J	1
RSB80A	0-3"	Soil	8/23/1999	85	J	0.6	7.4	J	1
RSB80B	3-10"	Soil	8/23/1999	23	U	0.6	7	J	1
RSB80C	24-30"	Soil	8/23/1999	23	U	0.6	6.7	J	1
RSB81A	0-3"	Soil	8/23/1999	229	J	0.6	9.4		1
RSB81B	3-10"	Soil	8/23/1999	18	U	0.6	9.3		1
RSB81C	24-30"	Soil	8/23/1999	11	U	0.6	7		1
RSB82A	0-3"	Soil	8/23/1999	16	J	0.6	8.5		1
RSB82B	3-10"	Soil	8/23/1999	37	J	0.6	24		1
RSB82C	24-30"	Soil	8/23/1999	16	J	0.6	9.3		1
RSB83A	0-3"	Soil	8/23/1999	17	U	0.6	9.9	J	1
RSB83B	3-10"	Soil	8/23/1999	11	U	0.6	7.4	J	1
RSB83C	24-30"	Soil	8/23/1999	31	J	0.6	16	J	1
RSB84A	0-3"	Soil	8/23/1999	16	J	0.6	10		1
RSB84B	3-10"	Soil	8/23/1999	21	J	0.6	15		1
RSB84C	24-30"	Soil	8/23/1999	12		0.6	5.7	J	1

TABLE 1
SOIL AND SEDIMENT LEAD AND ARSENIC RESULTS
RMC Beech Grove
Beech Grove, Indiana

LOCATION	DEPTH	MATRIX	DATE COLLECTED	LEAD (mg/kg)			ARSENIC (mg/kg)		
				RESULT	Q	DL	RESULT	Q	DL
RSB85A	0-3"	Soil	8/23/1999	9.1	J	0.6	7.1		1
RSB85B	3-10"	Soil	8/23/1999	8.2	J	0.6	6.7		1
RSB85C	24-30"	Soil	8/23/1999	8.7	J	0.6	7		1
RSBAA	0-3"	Soil	8/16/1999	966		0.6	10		1
RSBAB	3-10"	Soil	8/16/1999	269		0.6	7.1		1
RSBBA	0-3"	Soil	8/16/1999	2,430		0.6	19		1
RSBBB	3-10"	Soil	8/16/1999	490		0.6	8.4		1
RSED1A	0-6"	Sediment	8/22/1999	19,300		0.6	310		1
RSED1B	6-12"	Sediment	8/22/1999	29,900		0.6	263		1
RSED2A	0-6"	Sediment	8/22/1999	73,800		0.6	713		1
RSED2B	6-12"	Sediment	8/22/1999	4,080		0.6	229		1
RSED3A	0-6"	Sediment	8/22/1999	95,300		0.6	740		1
RSED3B	6-12"	Sediment	8/22/1999	8,420		0.6	184		1
RSED4A	0-6"	Sediment	8/22/1999	243,000		0.6	2,300		1
RSED4B	6-12"	Sediment	8/22/1999	17,300		0.6	531		1
RSED5A	0-6"	Sediment	8/22/1999	228,000		0.6	1,230		1
RSED5B	6-12"	Sediment	8/22/1999	182,000		0.6	3,880		1
RSED6A	0-6"	Sediment	8/25/1999	57,200	J	0.6	305		1
RSED6B	6-12"	Sediment	8/25/1999	14,800		0.6	114		1
RSED7A	0-6"	Sediment	8/25/1999	46,000	J	0.6	170		1
RSED7B	6-12"	Sediment	8/25/1999	20,500	J	0.6	78		1
RSED8A	0-6"	Sediment	8/25/1999	34,800		0.6	159		1
RSED8B	6-12"	Sediment	8/25/1999	25,900		0.6	103		1
RSED9A	0-6"	Sediment	8/25/1999	32,400		0.6	124		1
RSED9B	6-12"	Sediment	8/25/1999	14,800		0.6	50		1
RSED10A	0-6"	Sediment	8/25/1999	29,300		0.6	96		1
RSED10B	6-12"	Sediment	8/25/1999	15,300		0.6	61		1
RSED11A	0-6"	Sediment	8/25/1999	218,000	J	0.6	571		1
RSED12A	0-6"	Sediment	8/25/1999	172,000	J	0.6	1,150		1

TABLE 2A
SUMMARY OF INORGANIC GROUNDWATER RESULTS
Well MW-1
Refined Metals Corporation
Beech Grove, Indiana

Parameter		IDEM Residential Default RISC Criteria (µg/L)	USEPA Region 9 Tap Water PRGs (µg/L)	Sampling Events				
				9/21/1999	12/14/1999	9/22/2001	12/10/2001	1/23/2007
Antimony	Total	6	15	10 U	10 U	10 U	10 U	1 U
	Dissolved	6	15	--	--	--	10 U	1 U
Arsenic	Total	10	0.045	21	25	33	27	24
	Dissolved	10	0.045	--	--	--	22J	11
Barium	Total	2,000	2,600	96	86	101	93	--
	Dissolved	2,000	2,600	--	--	--	85	--
Cadmium	Total	5	18	0.2 U	0.2 U	0.2	0.2 U	--
	Dissolved	5	18	--	--	--	0.2 U	--
Calcium	Total	--	NA	--	--	--	--	280,000
	Dissolved	--	NA	--	--	--	--	280,000
Chromium	Total	100	110	1.8 U	1 U	3.1	4	--
	Dissolved	100	110	--	--	--	8.9 J	--
Iron	Total	--	11,000	--	--	--	--	5,600
	Dissolved	--	11,000	--	--	--	--	3,000
Lead	Total	15	NC	1.8 U	1 UJ	5.9	3.4	2.5 U
	Dissolved	15	NC	--	--	--	1U	1 U
Magnesium	Total	--	NA	--	--	--	--	120,000
	Dissolved	--	NA	--	--	--	--	120,000
Manganese	Total	--	880	--	--	--	--	160
	Dissolved	--	880	--	--	--	--	180
Mercury	Total	2	11	0.2 U	0.2 U	0.2 U	0.2 U	--
	Dissolved	2	11	--	--	--	--	--
Selenium	Total	50	180	9	73	6.1 J	4	--
	Dissolved	50	180	--	--	--	4.9 J	--
Silver	Total	182.5	180	0.2 R	0.2 UJ	0.2 UJ	0.2 U	--
	Dissolved	182.5	180	--	--	--	--	--
Sodium	Total	--	--	--	--	--	--	17,000
	Dissolved	--	--	--	--	--	--	17,000
pH				7.44	7.04	6.95	6.85	7.08
Dissolved Oxygen (ppm)				2.61	0.58	0.87	0.72	5.35
Specific Conductivity (mS)				1039	1231	1.317	1.58	1.98
Temperature (°C)				14.9	10	19.11	11.97	9.72
Oxidation/Reduction Potential (mv)				-187	-55	68	25	58
Turbidity (NTU)				43	12.9	129.4	174	55.2

NC - USEPA Region 9 does not have a tap water PRG for lead.
-- The sample was not analyzed for dissolved metals
Shading indicates the exceedance of the IDEM Residential Default RISC criteria.
Qualifiers: U - not detected; J - estimated; R - rejected; UJ - not detected, estimated reporting limit
Indicates result over Region 9 PRG (for antimony, barium, cadmium, chromium, iron, manganese, mercury, selenium or silver) or IDEM Residential Default Risk Criteria for arsenic or lead.

The results summarized are from groundwater sampling events performed by AGC following the RCRA Facility Work Plan.

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TABLE 2B
SUMMARY OF INORGANIC GROUNDWATER RESULTS
Well MW-2S
Refined Metals Corporation
Beech Grove, Indiana

Parameter		IDEM Residential Default RISC Criteria (µg/L)	USEPA Region 9 Tap Water PRGs (µg/L)	Sampling Events					
				9/21/1999	12/15/1999	9/22/2001	12/10/2001	10/27/2003	1/24/2007
Antimony	Total	6	15	10 U	10 U	10 U	10 U	10 U	5.2 U
	Dissolved	6	15	--	--	--	10 U	10 U	1.4
Arsenic	Total	10	0.045	9.8	15	12	12	15	24
	Dissolved	10	0.045	--	--	--	9.8 J	10	5.2
Barium	Total	2,000	2,600	40	45	31	48	44	--
	Dissolved	2,000	2,600	--	--	--	25	22	--
Cadmium	Total	5	18	0.2 U	0.2	0.3	0.4	0.2	--
	Dissolved	5	18	--	--	--	0.2 U	0.2 U	--
Chromium	Total	100	110	1 U	1.6	1 U	4.8	2.1	--
	Dissolved	100	110	--	--	--	6.8 J	3.1	--
Lead	Total	15	NC	11 U	18	49	84	44	75
	Dissolved	15	NC	--	--	--	6.2	2.9	1.2
Mercury	Total	2	11	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	--
	Dissolved	2	11	--	--	--	--	--	--
Selenium	Total	50	180	7.7	6	2 U	3.1	2 UJ	--
	Dissolved	50	180	--	--	--	3.7 J	2 U	--
Silver	Total	182.5	180	0.2 R	0.2 UJ	0.2 UJ	0.2 U	0.2 U	--
	Dissolved	182.5	180	--	--	--	--	--	--
pH				7.29	6.99	6.85	6.85	6.71	6.92
Dissolved Oxygen (ppm)				4.58	0.42	0.73	0.58	0.58	3.06
Specific Conductivity (mS)				1394	1657	1.83	2.09	1.93	1.89
Temperature (°C)				16	10.07	21.05	9.67	13.97	9.94
Oxidation/Reduction Potential (mv)				-43	-50	47	37	1	41
Turbidity (NTU)				8	27.5	21.2	154	8	81.9

NC - USEPA Region 9 does not have a tap water PRG for lead.
-- The sample was not analyzed for dissolved metals
Shading indicates the exceedance of the IDEM Residential Default RISC criteria.
Qualifiers: U - not detected; J - estimated; R - rejected; UJ - not detected, estimated reporting limit
NA- Not Analyzed

The results summarized are from groundwater sampling events performed by AGC following the RCRA Facility Work Plan.

TABLE 2C
SUMMARY OF INORGANIC GROUNDWATER RESULTS
Well MW-2D
Refined Metals Corporation
Beech Grove, Indiana

Parameter		IDEM Residential Default RISC Criteria (µg/L)	USEPA Region 9 Tap Water PRGs (µg/L)	Sampling Events		
				9/21/1999	12/15/1999	1/25/2007
Antimony	Total	6	15	10 U	10 U	1 U
	Dissolved	6	15	--	--	1 U
Arsenic	Total	10	0.045	6.3	15	19
	Dissolved	10	0.045	--	--	17
Barium	Total	2,000	2,600	334	311	--
	Dissolved	2,000	2,600	--	--	--
Cadmium	Total	5	18	0.2 U	0.2 U	--
	Dissolved	5	18	--	--	--
Calcium	Total	--	NA	--	--	72000
	Dissolved	--	NA	--	--	74000
Chromium	Total	100	110	5.2 U	1 U	--
	Dissolved	100	110	--	--	--
Iron	Total	--	11,000	--	--	2800
	Dissolved	--	11,000	--	--	2800
Lead	Total	15	NC	10 U	3.1 J	4.1
	Dissolved	15	NC	--	--	1 U
Magnesium	Total	--	NA	--	--	28000
	Dissolved	--	NA	--	--	29000
Manganese	Total	--	880	--	--	28
	Dissolved	--	880	--	--	28
Mercury	Total	2	11	0.2 U	0.2 U	--
	Dissolved	2	11	--	--	--
Selenium	Total	50	180	2 U	2 U	--
	Dissolved	50	180	--	--	--
Silver	Total	182.5	180	0.2 U	0.2 UJ	--
	Dissolved	182.5	180	--	--	--
Sodium	Total	--	--	--	--	25000
	Dissolved	--	--	--	--	27000
pH				7.83	7.28	7.19
Dissolved Oxygen (ppm)				5.33	0.39	2.15
Specific Conductivity (mS)				648	605	0.567
Temperature (°C)				15.48	12	7.17
Oxidation/Reduction Potential (mv)				54	-103	-39
Turbidity (NTU)				101	14.7	7.1

NC - USEPA Region 9 does not have a tap water PRG for lead.
-- The sample was not analyzed for dissolved metals
Shading indicates the exceedance of the IDEM Residential Default RISC criteria.
Qualifiers: U - not detected; J - estimated; R - rejected; UJ - not detected, estimated reporting limit
Indicates result over Region 9 PRG (for antimony, barium, cadmium, chromium, iron, manganese, mercury, selenium or silver) or IDEM Residential Default Risk Criteria for arsenic or lead.
The results summarized are from groundwater sampling events performed by AGC following the RCRA Facility Work Plan.

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TABLE 2D
SUMMARY OF INORGANIC GROUNDWATER RESULTS
Well MW-3
Refined Metals Corporation
Beech Grove, Indiana

Parameter		IDEM Residential Default RISC Criteria (μg/L)	USEPA Region 9 Tap Water PRGs (μg/L)	Sampling Events 9/22/1999	12/14/1999	9/22/2001	12/11/2001	10/26/2003	1/24/2007
Antimony	Total	6	15	10 U	10 U	10 U	10 U	10 U	1 U
	Dissolved	6	15	--	--	--	10 U	10 U	1 U
Arsenic	Total	10	0.045	11	7.8	9.7	11	28	170
	Dissolved	10	0.045	--	--	--	8.4J	7.5	5
Barium	Total	2,000	2,600	135	127	102	98	84	--
	Dissolved	2,000	2,600	--	--	--	113	73	--
Cadmium	Total	5	18	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	--
	Dissolved	5	18	--	--	--	0.2 U	0.2 U	--
Calcium	Total	--	NA	--	--	--	--	--	180,000
	Dissolved	--	NA	--	--	--	--	--	190,000
Chromium	Total	100	110	1.1	1 U	1 U	1 U	1 U	--
	Dissolved	100	110	--	--	--	6.6 J	4.9	--
Iron	Total	--	11,000	--	--	--	--	--	30,000
	Dissolved	--	11,000	--	--	--	--	--	1,900
Lead	Total	15	NC	1 U	1 UJ	1.3	1 U	1 U	3.9
	Dissolved	15	NC	--	--	--	1 U	1 U	0.31 J
Magnesium	Total	--	NA	--	--	--	--	--	67000
	Dissolved	--	NA	--	--	--	--	--	70000
Manganese	Total	--	880	--	--	--	--	--	120
	Dissolved	--	880	--	--	--	--	--	120
Mercury	Total	2	11	0.2 U	0.2 U	0.2 U	--	0.2 U	--
	Dissolved	2	11	--	--	--	--	--	--
Selenium	Total	50	180	5.2	5.3	2 U	1 U	2 UJ	--
	Dissolved	50	180	--	--	--	3.7J	2	--
Silver	Total	182.5	180	0.2 R	0.2 UJ	0.2 UJ	--	0.2 U	--
	Dissolved	182.5	180	--	--	--	--	--	--
Sodium	Total	--	--	--	--	--	--	--	38,000
	Dissolved	--	--	--	--	--	--	--	40,000
pH				7.02	6.87	6.97	6.77	6.96	6.94
Dissolved Oxygen (ppm)				1.57	0.47	0.39	0.46	0.54	1.12
Specific Conductivity (mS)				1069	1078	1.098	1.272	1.389	1.34
Temperature (°C)				15.1	13.2	16.9	12.73	13.39	5.68
Oxidation/Reduction Potential (mv)				-97	-52	40	32	25	27
Turbidity (NTU)				24	1.03	16.9	13.9	84.1	>1000

NC - USEPA Region 9 does not have a tap water PRG for lead.
-- The sample was not analyzed for dissolved metals
Shading indicates the exceedance of the IDEM Residential Default RISC criteria.
Qualifiers: U - not detected; J - estimated; R - rejected; UJ - not detected, estimated reporting limit
Indicates result over Region 9 PRG (for antimony, barium, cadmium, chromium, iron, manganese, mercury, selenium or silver) or IDEM Residential Default Risk Crieria for arsenic or lead.

The results summarized are from groundwater sampling events performed by AGC following the RCRA Facility Work Plan.

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TABLE 2E
SUMMARY OF INORGANIC GROUNDWATER RESULTS
Well MW-4
Refined Metals Corporation
Beech Grove, Indiana

Parameter		IDEM Residential Default RISC Criteria (μg/L)	USEPA Region 9 Tap Water PRGs (μg/L)	Sampling Events					
				9/22/1999	12/14/1999	9/24/2001	12/11/2001	10/26/2003	1/25/2007
Antimony	Total	6	15	10 U	10 U	10U	10U	10U	1U
	Dissolved	6	15	--	--	--	10U	10U	1U
Arsenic	Total	10	0.045	1.8	1.6	1U	1U	1.3	0.56J
	Dissolved	10	0.045	--	--	--	1UJ	1U	0.59J
Barium	Total	2,000	2,600	211	204	197	187	276	--
	Dissolved	2,000	2,600	--	--	--	203	213	--
Cadmium	Total	5	18	0.2 U	0.2 U	0.2U	0.2U	0.2U	--
	Dissolved	5	18	--	--	--	0.2U	0.2U	--
Calcium	Total	--	--	--	--	--	--	--	110000
	Dissolved	--	--	--	--	--	--	--	110000
Chromium	Total	100	110	3.1	1U	1U	1U	1U	--
	Dissolved	100	110	--	--	--	3.4J	2.1	--
Iron	Total	--	--	--	--	--	--	--	2300
	Dissolved	--	--	--	--	--	--	--	120
Lead	Total	15	NC	1.7	1UJ	1U	1.5	1U	3.9
	Dissolved	15	NC	--	--	--	1U	1U	0.24J
Magnesium	Total	--	--	--	--	--	--	--	34000
	Dissolved	--	--	--	--	--	--	--	35000
Maganese	Total	--	--	--	--	--	--	--	70
	Dissolved	--	--	--	--	--	--	--	60
Mercury	Total	2	11	0.2 U	0.2U	0.2U	0.2U	0.2U	--
	Dissolved	2	11	--	--	--	--	--	--
Selenium	Total	50	180	2 U	2U	2U	2U	2UJ	--
	Dissolved	50	180	--	--	--	2UJ	2U	--
Silver	Total	182.5	180	0.2 R	0.2UJ	0.2UJ	0.2U	0.2U	--
	Dissolved	182.5	180	--	--	--	--	--	--
Sodium	Total	--	--	--	--	--	--	--	27000
	Dissolved	--	--	--	--	--	--	--	28000
pH				7.24	7.07	7.07	6.87	6.98	7.12
Dissolved Oxygen (ppm)				2.78	0.43	0.5	0.63	0.61	3.8
Specific Conductivity (mS)				637	725	0.768	0.798	0.827	0.68
Temperature (°C)				17.1	12	15.29	12.38	15.07	5.35
Oxidation/Reduction Potential (mv)				-127	-53	151	127	44	140
Turbidity (NTU)				33	8.1	24.1	8.3	54.4	41.8

NC - USEPA Region 9 does not have a tap water PRG for lead.
-- The sample was not analyzed for dissolved metals
Shading indicates the exceedance of the IDEM Residential Default RISC criteria.
Qualifiers: U - not detected; J - estimated; R - rejected; UJ - not detected, estimated reporting limit

The results summarized are from groundwater sampling events performed by AGC following the RCRA Facility Work Plan.

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TABLE 2F
SUMMARY OF INORGANIC GROUNDWATER RESULTS
Well MW-5
Refined Metals Corporation
Beech Grove, Indiana

Parameter		IDEM Residential Default RISC Criteria (µg/L)	USEPA Region 9 Tap Water PRGs (µg/L)	Sampling Events						
				9/22/1999	12/14/1999	9/24/2001	12/11/2001	10/26/2003	4/24/2005	1/24/2007
Antimony	Total	6	15	10 U	10 U	10 U	10 U	10 U	1 U	1 U
	Dissolved	6	15	--	--	--	10 U	10 U	1 U	1 U
Arsenic	Total	10	0.045	8.4	10	7.6	5.4	8.8	3.2	4.3
	Dissolved	10	0.045	--	--	--	3.7 J	2.4	1.2	2.3
Barium	Total	2,000	2,600	149	162	170	150	159	177	--
	Dissolved	2,000	2,600	--	--	--	170	154	179	--
Cadmium	Total	5	18	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	--
	Dissolved	5	18	--	--	--	0.2 U	0.2 U	0.2 U	--
Calcium	Total	--	--	--	--	--	--	--	--	110,000
	Dissolved	--	--	--	--	--	--	--	--	110,000
Chromium	Total	100	110	1.5	1.9	1 U	1 U	1.1	1 U	--
	Dissolved	100	110	--	--	--	4 J	2.2	1.2	--
Iron	Total			--	--	--	--	--	--	1,000
	Dissolved			--	--	--	--	--	--	540
Lead	Total	15	NC	1 U	1 UJ	2	2.1	2.1	9.1	4.3
	Dissolved	15	NC	--	--	--	1 U	1 U	2.5	1 U
Magnesium	Total	--	--	--	--	--	--	--	--	38,000
	Dissolved	--	--	--	--	--	--	--	--	38,000
Maganese	Total	--	--	--	--	--	--	--	--	230
	Dissolved	--	--	--	--	--	--	--	--	210
Mercury	Total	2	11	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	--
	Dissolved	2	11	--	--	--	--	--	0.2 U	--
Selenium	Total	50	180	2 U	2.9	2 U	2 U	2 UJ	2 U	--
	Dissolved	50	180	--	--	--	2 UJ	2 U	2 U	--
Silver	Total	182.5	180	0.2 R	0.2 UJ	0.2 UJ	0.2 U	0.2 U	0.2 UJ	--
	Dissolved	182.5	180	--	--	--	--	--	0.2 UJ	--
Sodium	Total	--	--	--	--	--	--	--	--	29,000
	Dissolved	--	--	--	--	--	--	--	--	29,000
pH				7.47	7.14	7.14	6.92	7.08	7.95	7.13
Dissolved Oxygen (ppm)				3.05	0.29	0.43	0.43	0.62	0.51	1.21
Specific Conductivity (mS)				723	748	0.765	0.827	0.793	0.481	0.788
Temperature (°C)				18.2	13	16.54	12.81	12.3	10.66	5.65
Oxidation/Reduction Potential (mv)				-85	-43	90	51	107	215	62
Turbidity (NTU)				11.6	27.9	14.5	11.4	19.9	6.7	66.2

NC - USEPA Region 9 does not have a tap water PRG for lead.
-- The sample was not analyzed for dissolved metals
Shading indicates the exceedance of the IDEM Residential Default RISC criteria.
Qualifiers: U - not detected; J - estimated; R - rejected; UJ - not detected, estimated reporting limit
NA- Not Analyzed

The results summarized are from groundwater sampling events performed by AGC following the RCRA Facility Work Plan.

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TABLE 2G
SUMMARY OF INORGANIC GROUNDWATER RESULTS
Well MW-6S/6SR*
Refined Metals Corporation
Beech Grove, Indiana

Parameter		IDEM Residential Default RISC Criteria (µg/L)	USEPA Region 9 Tap Water PRGs (µg/L)	Sampling Events						
				9/23/1999	12/15/1999	9/24/2001	12/11/2001	10/26/2003	4/24/2005	1/24/2007
Antimony	Total	6	15	10 U	10 U	10 U	10 U	10 U	1 U	1 U
	Dissolved	6	15	10 U	10 U	--	10 U	10 U	1 U	1 U
Arsenic	Total	10	0.045	8.8 J	3.1	1.9	2.2	7.6	1 U	1.9
	Dissolved	10	0.045	1.7	1.6	--	1.4 J	1.2	1.5	0.885
Barium	Total	2000	2600	218	82	92	79	228	70	--
	Dissolved	2000	2600	39	36	--	89	117	90	--
Cadmium	Total	5	18	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	--
	Dissolved	5	18	0.2 U	0.2 U	--	0.2 U	0.2 U	0.2 U	--
Calcium	Total	--	NA	--	--	--	--	--	--	84000
	Dissolved	--	NA	--	--	--	--	--	--	76000
Chromium	Total	100	110	26	7.5	1 U	1 U	4.5	1 U	--
	Dissolved	100	110	8.7	1 U	--	3.8 J	2.1	1.3	--
Iron	Total	--	11,000	--	--	--	--	--	--	2600
	Dissolved	--	11,000	--	--	--	--	--	--	670
Lead	Total	15	NC	21	4.9 J	1 U	1.3	2.7	1 U	2.1
	Dissolved	15	NC	1 U	1 UJ	--	1 U	1 U	1 U	1 U
Magnesium	Total	--	NA	--	--	--	--	--	--	31000
	Dissolved	--	NA	--	--	--	--	--	--	28000
Maganese	Total	--	880	--	--	--	--	--	--	99
	Dissolved	--	880	--	--	--	--	--	--	85
Mercury	Total	2	11	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	--
	Dissolved	2	11	0.2 U	0.2	--	--	--	0.2 U	--
Selenium	Total	50	180	4.9 J	2.1	2 U	2 U	2 UJ	2 U	--
	Dissolved	50	180	2.9 J	2 U	--	2 UJ	2 U	2 U	--
Silver	Total	182.5	180	0.2 UJ	0.2 UJ	0.2 UJ	0.2 U	0.2 U	0.2 UJ	--
	Dissolved	182.5	180	0.2 U	0.2 UJ	--	--	--	0.2 UJ	--
Sodium	Total	--	--	--	--	--	--	--	--	35000
	Dissolved	--	--	--	--	--	--	--	--	37000
pH				7.05	7.5	713	6.87	7.2	7.27	7.02
Dissolved Oxygen (ppm)				8.21	3.34	0.48	0.62	0.76	0.45	1.69
Specific Conductivity (mS)				1578	1333	0.842	0.9	0.878	0.471	0.752
Temperature (°C)				14.2	8.7	16.2	10.58	12.97	8.99	9.34
Oxidation/Reduction Potential (mv)				342	50	78	50	62	219	0.696
Turbidity (NTU)				169	358	11.9	7.9	115.6	35	47

* MW-6S reconstructed as MW-6SR between 12/15/1999 and 9/24/2001 sampling events
NC - USEPA Region 9 does not have a tap water PRG for lead.
-- The sample was not analyzed for dissolved metals
Shading indicates the exceedance of the IDEM Residential Default RISC criteria.
Qualifiers: U - not detected; J - estimated; R - rejected; UJ - not detected, estimated reporting limit

The results summarized are from groundwater sampling events performed by AGC following the RCRA Facility Work Plan.

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TABLE 2H
SUMMARY OF INORGANIC GROUNDWATER RESULTS
Well MW-6D
Refined Metals Corporation
Beech Grove, Indiana

Parameter		IDEM Residential Default RISC Criteria (µg/L)	USEPA Region 9 Tap Water PRGs (µg/L)	Sampling Events			
				9/21/1999	12/15/1999	4/24/2005	1/23/2007
Antimony	Total	6	15	10 U	10 U	1 U	1 U
	Dissolved	6	15	--	--	1	1 U
Arsenic	Total	10	0.045	24	31	3.2	22
	Dissolved	10	0.045	--	--	3.2	19
Barium	Total	2,000	2,600	293	301	64	--
	Dissolved	2,000	2,600	--	--	60	--
Cadmium	Total	5	18	0.2 U	0.2 U	0.2 U	--
	Dissolved	5	18	--	--	0.2 U	--
Calcium	Total	--	NA	--	--	--	76,000
	Dissolved	--	NA	--	--	--	79,000
Chromium	Total	100	110	2	1 U	2.3	--
	Dissolved	100	110	--	--	2.2	--
Iron	Total	--	11,000	--	--	--	380
	Dissolved	--	11,000	--	--	--	270
Lead	Total	15	NC	2.2	1.2 J	7.1	1.7
	Dissolved	15	NC	--	--	1 U	1 U
Mercury	Total	2	11	0.2 U	0.2 U	0.2 U	--
	Dissolved	2	11	--	--	0.2 U	--
Magnesium	Total	--	NA	--	--	--	35,000
	Dissolved	--	NA	--	--	--	37,000
Maganese	Total	--	880	--	--	--	14
	Dissolved	--	880	--	--	--	14
Selenium	Total	50	180	2.1	2 U	2 U	--
	Dissolved	50	180	--	--	2 U	--
Silver	Total	182.5	180	0.2 R	0.2 UJ	0.2 UJ	--
	Dissolved	182.5	180	--	--	0.2 UJ	--
Sodium	Total	--	--	--	--	--	23,000
	Dissolved	--	--	--	--	--	24,000
pH				7.76	7.33	8.06	7.51
Dissolved Oxygen (ppm)				2.15	0.41	4.88	2.26
Specific Conductivity (mS)				545	680	0.861	0.695
Temperature (°C)				14.7	12.6	10.55	8.25
Oxidation/Reduction Potential (mv)				-166	-102	253	9.9
Turbidity (NTU)				15	13.3	1.4	3.97

NC - USEPA Region 9 does not have a tap water PRG for lead.
-- The sample was not analyzed for dissolved metals
Shading indicates the exceedance of the IDEM Residential Default RISC criteria.
Qualifiers: U - not detected; J - estimated; R - rejected; UJ - not detected, estimated reporting limit
Indicates result over Region 9 PRG (for antimony, barium, cadmium, chromium, iron, manganese, mercury, selenium or silver) *or IDEM Residential Default Risk Criteria for arsenic or lead.*

The results summarized are from groundwater sampling events performed by AGC following the RCRA Facility Work Plan.

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TABLE 2I
SUMMARY OF INORGANIC GROUNDWATER RESULTS
Well MW-7/ 7S
Refined Metals Corporation
Beech Grove, Indiana

Parameter		IDEM Residential Default RISC Criteria (µg/L)	USEPA Region 9 Tap Water PRGs (µg/L)	Sampling Events			
				9/22/2001	12/11/2001	10/27/2003	1/25/2007
Antimony	Total	6	15	10U	10U	10U	2.9
	Dissolved	6	15	--	10U	10U	1U
Arsenic	Total	10	0.045	25	26	290	190
	Dissolved	10	0.045	--	30J	25	5.9
Barium	Total	2,000	2,600	21	25	17	--
	Dissolved	2,000	2,600	--	23	15	--
Cadmium	Total	5	18	0.2U	0.2U	0.2U	--
	Dissolved	5	18	--	0.2U	0.2U	--
Calcium	Total	--	NA	--	--	--	470000
	Dissolved	--	NA	--	--	--	480000
Chromium	Total	100	110	1U	2.8	1.9	--
	Dissolved	100	110	--	13J	7.4	--
Iron	Total	--	11,000	--	--	--	30000
	Dissolved	--	11,000	--	--	--	4100
Lead	Total	15	NC	19	47	217	94
	Dissolved	15	NC	--	2.5	1	1U
Magnesium	Total	--	NA	--	--	--	290000
	Dissolved	--	NA	--	--	--	280000
Manganese	Total	--	880	--	--	--	250
	Dissolved	--	880	--	--	--	220
Mercury	Total	2	11	0.2U	0.2U	.2U	--
	Dissolved	2	11	--	--	--	--
Selenium	Total	50	180	3.7J	5.7	2UJ	--
	Dissolved	50	180	--	6.5J	2U	--
Silver	Total	182.5	180	0.2UJ	0.2U	.2U	--
	Dissolved	182.5	180	--	--	--	--
Sodium	Total	--	--	--	--	--	310000
	Dissolved	--	--	--	--	--	300000
pH				6.59	6.41	6.46	6.79
Dissolved Oxygen (ppm)				0.5	0.79	0.54	2.6
Specific Conductivity (mS)				3.8	4.50	3.92	3.71
Temperature (°C)				20.73	13.78	15.03	8.43
Oxidation/Reduction Potential (mv)				6	48	47	28
Turbidity (NTU)				6.8	27	242	501

NC - USEPA Region 9 does not have a tap water PRG for lead.
-- The sample was not analyzed for dissolved metals
Shading indicates the exceedance of the IDEM Residential Default RISC criteria.
Qualifiers: U - not detected; J - estimated; R - rejected; UJ - not detected, estimated reporting limit
Indicates result over Region 9 PRG (for antimony, barium, cadmium, chromium, iron, manganese, mercury, selenium or silver) or IDEM Residential Default Risk Criteria for arsenic or lead.

The results summarized are from groundwater sampling events performed by AGC following the RCRA Facility Work Plan.

TABLE 2J
SUMMARY OF INORGANIC GROUNDWATER RESULTS
Well MW-8/ 8S
Refined Metals Corporation
Beech Grove, Indiana

Parameter		IDEM Residential Default RISC Criteria (µg/L)	USEPA Region 9 Tap Water PRGs (µg/L)	Sampling Events			
				9/22/2001	12/11/2001	10/28/2003	1/24/2007
Antimony	Total	6	15	14	10U	10U	5.7
	Dissolved	6	15	--	10U	10U	5
Arsenic	Total	10	0.045	5.1	13	19	3.2
	Dissolved	10	0.045	--	14	17	2
Barium	Total	2,000	2,600	133	123	89	--
	Dissolved	2,000	2,600	--	135	79	--
Cadmium	Total	5	18	0.8	0.40	0.2U	--
	Dissolved	5	18	--	0.30	0.2U	--
Calcium	Total	--	NA	--	--	--	140,000
	Dissolved	--	NA	--	--	--	140,000
Chromium	Total	100	110	1U	1U	1.1	--
	Dissolved	100	110	--	3.8	2.9	--
Iron	Total	--	11,000	--	--	--	190
	Dissolved	--	11,000	--	--	--	40
Lead	Total	15	NC	21	23	55	21
	Dissolved	15	NC		11.0	15	2.1
Magnesium	Total	--	NA	--	--	--	66,000
	Dissolved	--	NA	--	--	--	68,000
Manganese	Total	--	880	--	--	--	95
	Dissolved	--	880	--	--	--	27
Mercury	Total	2	11	.2U	0.2U	0.2U	--
	Dissolved	2	11	--	--	--	--
Selenium	Total	50	180	2U	2U	2UJ	--
	Dissolved	50	180	--	2UJ	2U	--
Silver	Total	182.5	180	0.2UJ	.2U	0.2U	--
	Dissolved	182.5	180	--	--	--	--
Sodium	Total	--	--	--	--	--	39,000
	Dissolved	--	--	--	--	--	38,000
pH				7.11	7.13	7.23	7.17
Dissolved Oxygen (ppm)				0.55	0.59	0.91	4.41
Specific Conductivity (mS)				0.919	1.02	1.028	1.176
Temperature (°C)				20.42	15.43	13.88	9.17
Oxidation/Reduction Potential (mv)				171	67	45	169
Turbidity (NTU)				3.9	5.3	6.9	15.3

NC - USEPA Region 9 does not have a tap water PRG for lead.
-- The sample was not analyzed for dissolved metals
Shading indicates the exceedance of the IDEM Residential Default RISC criteria.
Qualifiers: U - not detected; J - estimated; R - rejected; UJ - not detected, estimated reporting limit
Indicates result over Region 9 PRG (for antimony, barium, cadmium, chromium, iron, manganese, mercury, selenium or silver) or IDEM Residential Default Risk Criteria for arsenic or lead.

The results summarized are from groundwater sampling events performed by AGC following the RCRA Facility Work Plan.

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TABLE 2K
SUMMARY OF INORGANIC GROUNDWATER RESULTS
Well MW-9
Refined Metals Corporation
Beech Grove, Indiana

Parameter		IDEM Residential Default RISC Criteria (μg/L)	USEPA Region 9 Tap Water PRGs	Sampling Events				
				9/22/2001	12/10/2001	10/27/2003	4/24/2005	1/22/2007
Antimony	Total	6	15	10 U	10 U	10 U	1 U	1 U
	Dissolved	6	15	--	10 U	10 U	1 U	1 U
Arsenic	Total	10	0.045	7.7	4	4.2	2.1	1.6
	Dissolved	10	0.045	--	3.7 J	2.7	1 U	1
Barium	Total	2,000	2,600	137	68	43	39	--
	Dissolved	2,000	2,600	--	68	41	36	--
Cadmium	Total	5	18	0.2 U	0.2 U	0.2 U	0.2 U	--
	Dissolved	5	18	--	0.2 U	0.2 U	0.2 U	--
Calcium	Total	--	NA	--	--	--	--	160,000
	Dissolved	--	NA	--	--	--	--	160,000
Chromium	Total	100	110	1 U	2.2	1 U	1 U	--
	Dissolved	100	110	--	3.8 J	1.9	1 U	--
Iron	Total	--	11,000	--	--	--	--	270
	Dissolved	--	11,000	--	--	--	--	4.5
Lead	Total	15	NC	1.6	1 U	1	2.2	0.43 J
	Dissolved	15	NC	--	1 U	1 U	1 U	1 U
Mercury	Total	2	11	0.2 U	0.2 U	0.2 U	0.2 U	--
	Dissolved	2	11	--	--	--	0.2 U	--
Magnesium	Total	--	NA	--	--	--	--	50,000
	Dissolved	--	NA	--	--	--	--	49,000
Manganese	Total	--	880	--	--	--	--	37
	Dissolved	--	880	--	--	--	--	7.7
Selenium	Total	50	180	2 U	2 U	2 UJ	2 U	--
	Dissolved	50	180	--	2 UJ	2 U	2 U	--
Silver	Total	182.5	180	0.2 UJ	0.2 U	0.2 U	0.2 UJ	--
	Dissolved	182.5	180	--	--	--	0.2 UJ	--
Sodium	Total	--	--	--	--	--	--	14,000
	Dissolved	--	--	--	--	--	--	15,000
pH				7.22	7.02	6.97	8.17	7.12
Dissolved Oxygen (ppm)				4.88	1.11	0.7	2.09	5.12
Specific Conductivity (mS)				0.874	1.094	0.967	0.494	0.95
Temperature (°C)				16.55	11.74	13.52	7.11	8.01
Oxidation/Reduction Potential (mv)				202	68	56	218	195
Turbidity (NTU)				0.9	0.9	7.9	4.9	7.36

NC - USEPA Region 9 does not have a tap water PRG for lead.
-- The sample was not analyzed for dissolved metals
Shading indicates the exceedance of the IDEM Residential Default RISC criteria.
Qualifiers: U - not detected; J - estimated; R - rejected; UJ - not detected, estimated reporting limit

The results summarized are from groundwater sampling events performed by AGC following the RCRA Facility Work Plan.

TABLE 2L
SUMMARY OF INORGANIC GROUNDWATER RESULTS
Well MW-10
Refined Metals Corporation
Beech Grove, Indiana

Parameter		IDEM Residential Default RISC Criteria (μg/L)	USEPA Region 9 Tap Water PRGs (μg/L)	Sampling Events	
				10/28/2003	1/23/2007
Antimony	Total	6	15	10U	1U
	Dissolved	6	15	10U	1U
Arsenic	Total	10	0.045	24	22
	Dissolved	10	0.045	7.5	5.8
Barium	Total	2,000	2,600	71	--
	Dissolved	2,000	2,600	16.00	--
Cadmium	Total	5	18	0.2U	--
	Dissolved	5	18	0.2U	--
Calcium	Total	--	NA	--	270,000
	Dissolved	--	NA	--	360,000
Chromium	Total	100	110	1.6U	--
	Dissolved	100	110	5.2	--
Iron	Total	--	11,000	--	17,000
	Dissolved	--	11,000	--	11,000
Lead	Total	15	NC	1U	2.1U
	Dissolved	15	NC	1U	1U
Magnesium	Total	--	NA	--	610,000
	Dissolved	--	NA	--	590,000
Manganese	Total	--	880	--	340
	Dissolved	--	880	--	340
Mercury	Total	2	11	0.2U	--
	Dissolved	2	11	--	--
Selenium	Total	50	180	2UJ	--
	Dissolved	50	180	2.3	--
Silver	Total	182.5	180	0.2U	--
	Dissolved	182.5	180	--	--
Sodium	Total	--	--	--	1,000,000
	Dissolved	--	--	--	1,000,000
pH				6.73	6.99
Dissolved Oxygen (ppm)				0.74	1.87
Specific Conductivity (mS)				6.69	7.24
Temperature (°C)				10.23	7.91
Oxidation/Reduction Potential (mv)				68	-1
Turbidity (NTU)				15.8	179.0

NC - USEPA Region 9 does not have a tap water PRG for lead.
-- The sample was not analyzed for dissolved metals
Shading indicates the exceedance of the IDEM Residential Default RISC criteria.
Qualifiers: U - not detected; J - estimated; R - rejected; UJ - not detected, estimated reporting limit
Indicates result over Region 9 PRG (for antimony, barium, cadmium, chromium, iron, manganese, mercury, selenium or silver) or IDEM Residential Default Risk Criteria for arsenic or lead.

The results summarized are from groundwater sampling events performed by AGC following the RCRA Facility Work Plan.

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TABLE 2M
SUMMARY OF INORGANIC GROUNDWATER RESULTS
Well MW-11
Refined Metals Corporation
Beech Grove, Indiana

Parameter		IDEM Residential Default RISC Criteria (µg/L)	USEPA Region 9 Tap Water PRGs (µg/L)	Sampling Events	
				10/27/2003	1/25/2007
Antimony	Total	6	15	10U	1.20
	Dissolved	6	15	10U	1U
Arsenic	Total	10	0.045	7.1	4
	Dissolved	10	0.045	7.10	1
Barium	Total	2,000	2,600	167	--
	Dissolved	2,000	2,600	167	--
Cadmium	Total	5	18	0.2U	--
	Dissolved	5	18	0.2U	--
Calcium	Total	--	NA	--	170,000
	Dissolved	--	NA	--	170,000
Chromium	Total	100	110	1.1	--
	Dissolved	100	110	1U	--
Iron	Total	--	11,000	--	960
	Dissolved	--	11,000	--	28
Lead	Total	15	NC	1U	3
	Dissolved	15	NC	1U	0.99
Magnesium	Total	--	NA	--	64,000
	Dissolved	--	NA	--	67,000
Manganese	Total	--	880	--	260
	Dissolved	--	880	--	210
Mercury	Total	2	11	0.2U	--
	Dissolved	2	11	--	--
Selenium	Total	50	180	2UJ	--
	Dissolved	50	180	2U	--
Silver	Total	182.5	180	0.2U	--
	Dissolved	182.5	180	--	--
Sodium	Total	--	--	--	66,000
	Dissolved	--	--	--	71,000
pH				7.06	7.15
Dissolved Oxygen (ppm)				0.74	3.19
Specific Conductivity (mS)				1.116	1.416
Temperature (°C)				11.17	10.77
Oxidation/Reduction Potential (mv)				41	136
Turbidity (NTU)				3.1	19.8

NC - USEPA Region 9 does not have a tap water PRG for lead.
-- The sample was not analyzed for dissolved metals
Shading indicates the exceedance of the IDEM Residential Default RISC criteria.
Qualifiers: U - not detected; J - estimated; R - rejected; UJ - not detected, estimated reporting limit

The results summarized are from groundwater sampling events performed by AGC following the RCRA Facility Work Plan.

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TABLE 3
RMC Beech Grove CMS
Alternative #2 Cost Estimate
Excavation All Areas
(Including SWMUs)

Item	Unit	Quantity	Unit Cost	Total
1 Mob/Demob (Excavation Equipment and Support Facilities)	LS	1	$50,000	$50,000
2 Health & Safety	LS	1	$25,000	$25,000
3 Decontamination (Excludes Buildings)	LS	1	$15,000	$15,000
4 Air Monitoring	LS	1	$20,000	$20,000
5 Temporary Erosion Controls				
Silt Fence	LF	5000	$2.60	$13,000
6 Storm Water Control During Construction (collect and filter)	LS	1	$20,000	$20,000
7 **General Site Preparation Activities**				
Construction Access/Decon Areas	LS	4	$1,500	$6,000
Clearing and Grubbing	AC	2.0	$1,475	$2,950
Chain Link Fence Removal	LF	2180	$3	$6,540
8 Concrete Removal				
<6" thick slab w/ mesh reinforcement	sy	1385	$10.75	$14,889
7" to 24" thick portions with Rod Reinforcing	CY	612	$115.00	$70,380
9 Asphalt Removal	SY	714	$6.55	$4,677
10 Utility Clearance	LS	1	$10,000	$10,000
11 Excavation/ Consolidation (to stockpile or containment cell)@1.5 tons/cy				
11a On-Site (Selective Deep Removal)	ton	9,078	$21.89	$198,717
11b Off-Site (Shallow <2 ft)	ton	12,128	$3.60	$43,661
12 Confirmatory soil sampling	each	150	$100.00	$15,000
13 Bldg Decon (Battery Brkr, furnace, refining,warehouse & office)	sf	57450	$0.93	$53,429
14 Decon and Demo Baghouses	LS	3	$50,000.00	$150,000
15 Bldg Decon and Demolition (Mat Storage,WWTP, Filter Press)	sf	32460	2.75	$89,265
16 Borrow Soils (imported and placed)@1.5 tons/cy				
16a On-Site (Small, Limited, Deep)	ton	9,078	$18.17	$164,947
16b Off-Site (Shallow, Contiguous Area)	ton	12,128	$7.67	$93,022
17 Restore drainage ditch and grassy area swale w/ sod	MSF	124	$363.00	$45,012
18 Hydroseeding (with mulch and fertilizer)	MSF	266.82	$77.78	$20,753
19 Deed Restriction	LS	1	$5,000.00	$5,000
ALTERNATIVE 2 SUBTOTAL				$1,137,241
Engineering/QA/Legal Fees (10% of Subtotal)				$113,724
Contingency (10% of Subtotal)				$113,724
ALTERNATIVE 2 TOTAL CAPITAL COST				$1,364,690

TABLE 4
RMC Beech Grove CMS
Alternative #3A Cost Estimate

RCRA Capping Option

I. Direct Capital Costs

Item	Unit	Quantity	Unit Cost	Total	Unit Cost Source
1 Mobilization (Liner Crew)_	LS	1	$10,000	$10,000	
2 RCRA Cap					
Grading and Berm Construction (15' avg width, 2' high, 1200' long)	CY	1333	$13.52	$18,022	Avg of similar Project bid in 2005
Geomembrane, Geocomposite, Topsoil and Hydroseed (1.15 AC)	AC	1.15	$58,600.00	$67,390	Avg of similar Project bid in 2005
Cover Soil (18" thick, imported)	SY	5566	$6.76	$37,626	Avg of similar Project bid in 2005
3 Place Remediated Soil with Dozer (in lifts)	CY	9500	$2.41	$22,895	Means 2005 Site Work 02300 520 0170
4 Permieter Erosion & Sediment Control Measures	LS	1	$15,000.00	$15,000	Engineers Estimate
5 Erosion Control Mat (Jute Net)	SY	5566	$1.26	$7,013	Means 2005 Site Work 02300 700 0020
6 Monitoring Well Installation	LS	3	$4,000.00	$12,000	
ALTERNATE 3A CAPITAL COST SUBTOTAL				**$189,946**	
Engineering/QA/Legal (10% of Direct Capital Costs)				$18,995	
Contingency (10% of Total Direct Capital Costs)				$18,995	
ALTERNATE 3A CAPITAL COST TOTAL				**$227,936**	

Operations & Maintenance Costs for 30 years

Item	Unit	Quantity	Unit Cost	Total
1 Inspection/Repair (Annual Site Visit and Mowing)	LS	30	$5,000	$150,000
2 Major Repair Once Every 5 years @ 5% of Construction Cost	LS	6	$11,397	$68,382
3 Groundwater Monitoring ($7,500/event)	LS	36	$7,500	$270,000

Present Worth of 30 years of O&M (i = 35% and n=30 years) **$174,000**

TOTAL COST (CAPITAL AND PRESENT WORTH O&M) **$401,936**

***Note: Placement volume assumes finished slopes at 25%**

TABLE 5
RMC Beech Grove CMS
Alternate #3B Cost Estimate
Asphalt Cap

I. Direct Capital Costs

Item	Unit	Quantity	Unit Cost	Total
1 Mobilization _	LS	1	$5,000	$5,000
2 Asphalt Cap (1.15 AC)				
Grading and Berm Construction (15' avg width, 2' high, 800' long)	CY	1333	$13.52	$18,022
Geotextile	SY	5566	$1.13	$6,290
Asphaltic Conc. Pavement (6" stone base, 2" binder, 1" top)	sf	50000	$1.98	$99,000
3 Place Remediated Soil and Demolished Pavement with Dozer (in lifts)	CY	6888	$2.41	$16,600
4 Permieter Erosion & Sediment Control Measures	LS	1	$15,000.00	$15,000
5 Monitoring Well Installation	LS	3	$4,000.00	$12,000
ALTERNATE 3B CAPITAL COST SUBTOTAL				**$171,912**
Engineering/QA/Legal Fees (10% of Direct Capital Costs)				$17,191
Contingency (10% of Total Direct Capital Costs)				$17,191
ALTERNATE 3B CAPITAL COST TOTAL				**$206,294**

Operations & Maintenance Costs for 30 years

		Unit	Quantity	Unit Cost	Total
1	Inspection/Repair (Annual Site Visit and Inspection)	LS	30	$5,000	$150,000
2	Slurryseal 10 times in 30 years over 5,566 SY	SY	55,660	1.33	$74,028
3	Groundwater Monitoring (7,500/event)	LS	36	7500	$270,000

Present Worth of 30 years of O&M **$176,012**

TOTAL COST (CAPITAL AND PRESENT WORTH O&M) **$382,306**

TABLE 6
RMC Beech Grove CMS
Alternative #4 Cost Estimate
Off-Site Disposal
(Excluding SWMUs)

Alternative 4: Stabilization and Off-Site Disposal

Item	Unit	Quantity	Unit Cost	Total
1 Mob/Demob (Stabilization Equipment)	LS	1	$15,000	$15,000
2 Stabilization (Use 1.5 tons/cy)				
2a On-Site Soil and Sediment	ton	9078	$26	$236,028
2b Off-Site Soil and Sediment*	ton	3032	$26	$78,832
3 Soil and Sediment Transportation and Disposal (Use 1.5 tons/cy)				
3a On-Site Soil and Sediment	ton	9078	$23	$208,794
3b Off-Site Soil and Sediment	ton	12,128	$23	$278,944
3c Asphalt and Concrete @ 1.7 ton/cy	ton	1,413	$22.59	$31,920
ALTERNATIVE 2A SUBTOTAL				$849,518
Contingency (15% of Subtotal)				$127,428
ALTERNATIVE 4 TOTAL COST				**$976,946**

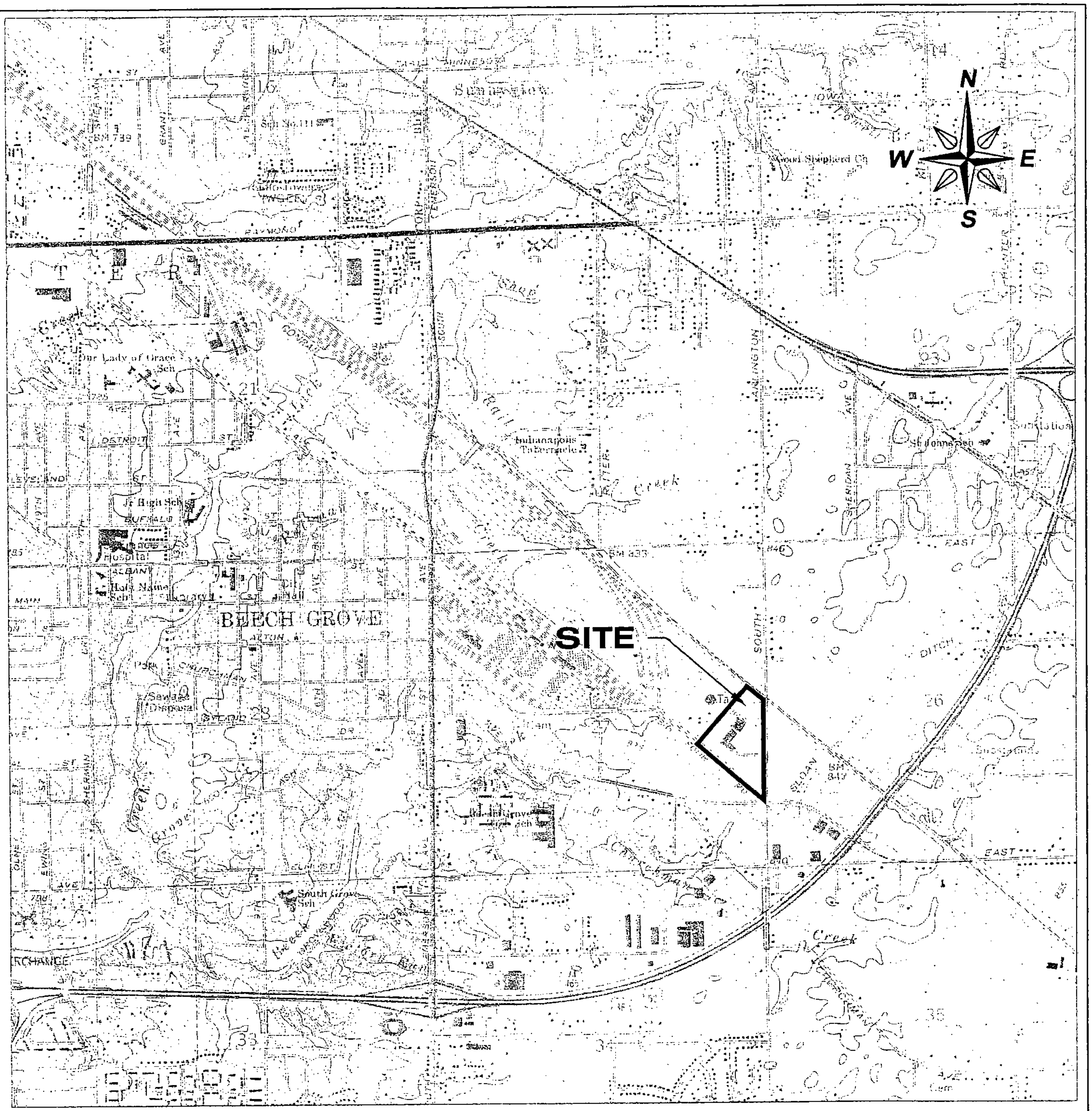
*** Note: Assume 25% of off-site soil and sediment requires stabilization**

TABLE 7
RMC Beech Grove CMS
Groundwater Alternative #7 Cost Estimate
Groundwater Extraction and Treatment

Alternative 7: Groundwater Extraction and Treatment

	Item	Unit	Quantity	Unit Cost	Total
I. Direct Capital Costs					
	1a Mobilization/Site Prep	LS	1	$15,000	$15,000
	1b Indirect	LS	1	$3,000	$3,000
	2 Design, Work Plans and Permitting				
	2a Desing Plans and Deliverable	EA	1	$40,000	$40,000
	2b Permitting	EA	1	$5,000	$5,000
	2c Regulatory Approvals	EA	1	$5,000	$10,000
	2d Indirect Costs	LS	1	$11,000	$11,000
	3 Well Installation	EA	5	$5,000	$25,000
	4 Extraction and Treatment System				
	4a Equipment	LS	1	$351,000	$351,000
	4b Installation	LS	1	$75,200	$75,200
	TOTAL DIRECT CAPITAL COST				**$535,200**
II. Operation and Maintenance (5 yrs)					
	1 Annual Operating Cost	LS	5	$20,125.00	$100,625
	Present Worth (i = 3.5%, n = 5 years)				**$90,865**
	TOTAL COST (CAPITAL AND PRESENT WORTH)				**$626,065**

FIGURES



REF. U.S.G.S. 7 1/2 MINUTE
BEECH GROVE, IND
QUADRANGLE MAP

2000 0 2000 4000

SCALE IN FEET

REFINED METALS CORPORATION
PHASE II CMS REPORT

BEECH GROVE, INDIANA

Scale 1"=2000'	SITE LOCATION MAP
Originated By K.M.S.	
Drawn By P.S.G.	
Checked By S.W.K.	Advanced GeoServices Corp. 1055 Andrew Drive, Suite A West Chester, Pennsylvania 19380 (610) 840-9100 FAX (610) 840-9199
Project Mgr P.C.S.	
Dwg No. 2003-1046-05-02	
Project No. 2003-1046-05	FIGURE: 1

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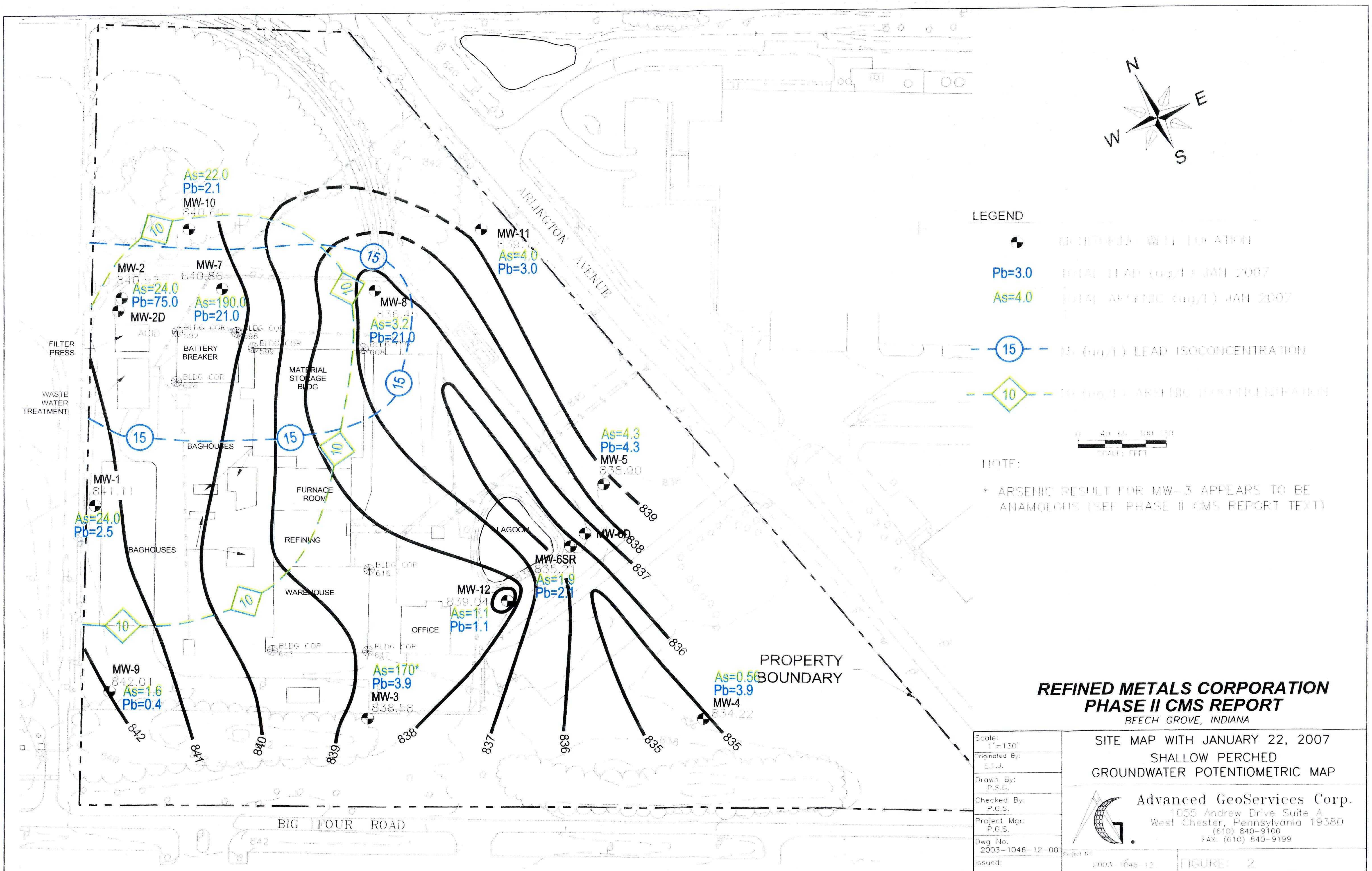

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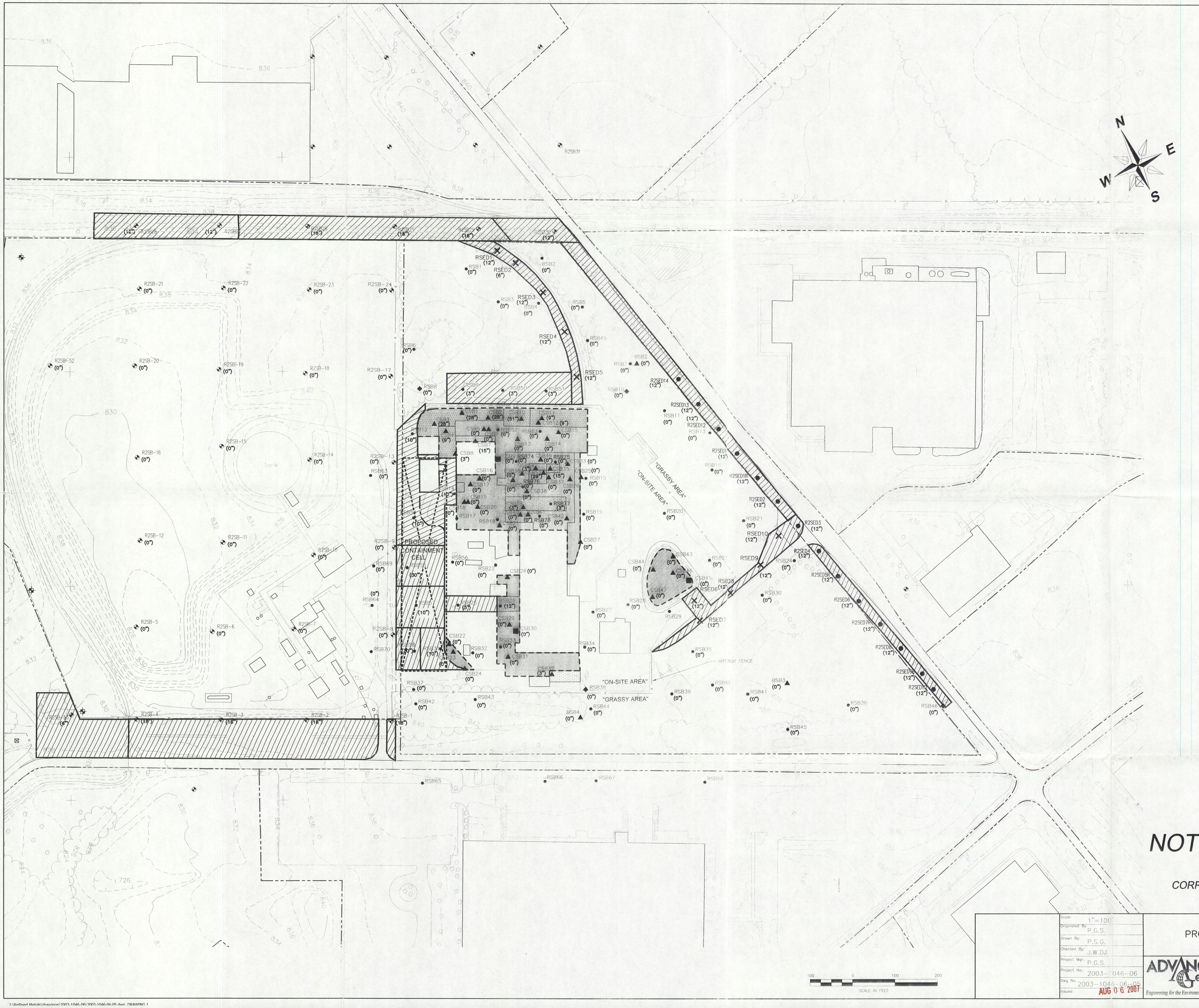
Revision	Description	Date	By
1	ADDED "PROPOSED CONTAINMENT CELL" FOOTPRINT AND NOTE 3.	5/8/06	P.G.S.
2	ADDED OFF-SITE EXCAVATION AREAS	1/8/07	P.G.S.
3	REMOVED CITIZENS GAS EXCAVATION	8/6/07	P.G.S.



LEGEND

- CSB30 — APPROXIMATE SOIL SAMPLE LOCATION
- CSB26 — SOIL SAMPLE LOCATION/DESIGNATION SURVEYED BY THE SCHNEIDER CORP., INDIANAPOLIS, INDIANA
- RSB77 — SOIL SAMPLE LOCATION/DESIGNATION SURVEYED BY THE SCHNEIDER CORP., INDIANAPOLIS, INDIANA
- R2SB25 — PHASE II RFI SOIL SAMPLING
- R2SED1R — SEDIMENT SAMPLE LOCATION ARLINGTON AVE. DRAINAGE DITCH
- RSB8 — SEDIMENT SAMPLE LOCATION ARLINGTON AVE. DRAINAGE DITCH
- RSED3 — SEDIMENT SAMPLE LOCATION IN GRASSY AREA SWALES
- (0") — DEPTH OF EXCAVATION REQUIRED TO REMOVE SOIL OR SEDIMENT WITH TOTAL LEAD CONCENTRATION ABOVE RAL ESTABLISHED IN BHHRA
- APPROXIMATE PROPERTY BOUNDARY
- FENCE LINE
- EXISTING CONTOUR
- (#) — NON-SWMU EXCAVATION AREA WITH EXCAVATION DEPTH IN INCHES
- SOLID WASTE MANAGEMENT UNIT AS DELINEATED ON EXHIBIT B OF CONSENT DECREE
- (#) — SOIL WASTE MANAGEMENT UNIT EXCAVATION AREA. PROJECTED REMOVAL DEPTH AS SHOWN.

NOTES:

1. This drawng is based on the proposed remedy as evaluated under Corrective Measure Study – Phase II
2. Excavation area depths were selected using cleanup standards of 8,470 ppm for lead in "On-Site Site" soils (within the interior fence) and 4,954 ppm of lead in "Grassy Area" and "Off-Site" soils. These cleanup standards were based on risk assessment results from Corrective Measure Study – Phase I.
3. The excavation areas shown within the footprint of the proposed containment cell do not require excavation for CMS Alternatives 3A and 3B except as required to accomodate the cap anchor trench. Final detailing will be provided in the Corrective Measures Design.

ON-SITE (NON-SWMU) EXCAVATION TABLE

SAMPLE(S)	SURFACE AREA (sf)	REMOVAL DEPTH (in)	SOIL REMOVAL VOLUME (cf)	COVER TYPE
RSB-58 *	5,684	30	14,210	Bare/Weeds
RSB-31 *	6,076	10	5,063	Bare/Weeds
RSB-57 *	11,155	10	9,296	Bare/Weeds
RSB-55 *	10,810	30	27,025	Bare/Weeds
RSB-54* and 12	23,135	10	19,279	Bare/Weeds
RSED-6	2,205	12	2,025	Grass
RSB-25	4,750	3	1,188	Bituminous Pavement
Battery Breaker	7,176	15	8,970	Concrete
	55,065 sf Bare/Grass		76,898 cf Bare	
	11,926 sf Building/Pavement		10,158 cf Pvmt	

* Located within footprint of proposed Containment Cell

SWMU EXCAVATION TABLE

SAMPLE(S)	SURFACE AREA (sf)	REMOVAL DEPTH (in)	SOIL REMOVAL VOLUME (cf)	COVER TYPE
CSB-1, 2 and 3	8,525	28	19,892	Concrete 6"
CSB-4 and 8	3,000	9	2,250	Concrete 6"
CSB-7	940	15	1,175	Concrete 6"
CSB-10	2,790	51	11,858	Concrete 8"
CSB-11	5,805	9	4,354	Concrete 8"
CSB-32	2,150	3	531	Grass
CSB-34	688	3	172	Concrete 12"
CSB-35	600	15	750	Building 12"
CSB-39, RSB-77	5,075	3	1,269	Building 12"
CSB-51	1,200	39	3,900	Building 12"
RSB-26	1,672	12	1,672	Bituminous Pavement
			47,823	

Total SWMUs = 1,771 cy (Does not include sediment from inside Surface Impoundment)

GRASSY AREA EXCAVATION TABLE

SAMPLE(S)	SURFACE AREA (sf)	REMOVAL DEPTH (in)	SOIL REMOVAL VOLUME (cf)	COVER TYPE
RSB-9, 50, 51	20,790	3	5,198	Brush
RSED 1, 2, 3, 4, 5	11,750	12	11,750	Brush
RSED 7, 8, 9, 10	11,600	12	11,600	Grass
	44,140 sf		28,548 cf	

OFF-SITE EXCAVATION TABLE

SAMPLE(S)	SURFACE AREA (sf)	REMOVAL DEPTH (in)	SOIL REMOVAL VOLUME (cf)	COVER TYPE
ARLINGTON AVE ROW	34,250	12	34,250	Grass
R2SB27, R2SB28, R2SB30	31,150	12	31,150	Ballast
R2SB25, R2SB26, R2SB29	35,420	18	54,630	Ballast
R2SB-1, R2SB-2, R2SB-3, R2SB-4	56,990	18	85,485	Grass/Stone
RSB-53	25,570	6	12,785	Grass/Stone
TOTAL	184,380	-	218,300	-

NOT FOR CONSTRUCTION

REFINED METALS CORPORATION
CORRECTIVE MEASURES STUDY PHASE 2 REPORT

BEECH GROVE, IN

Scale:	1"=100'
Originated By:	P.G.S.
Drawn By:	P.S.G.
Checked By:	J.W.DJ.
Project Mgr.:	P.G.S.
Project No.:	2003-1046-06
Dwg No.	2003-1046-06-05
Issued:	AUG 0 6 2007

PROPOSED EXCAVATION AREAS

ADVANCED GeoServices
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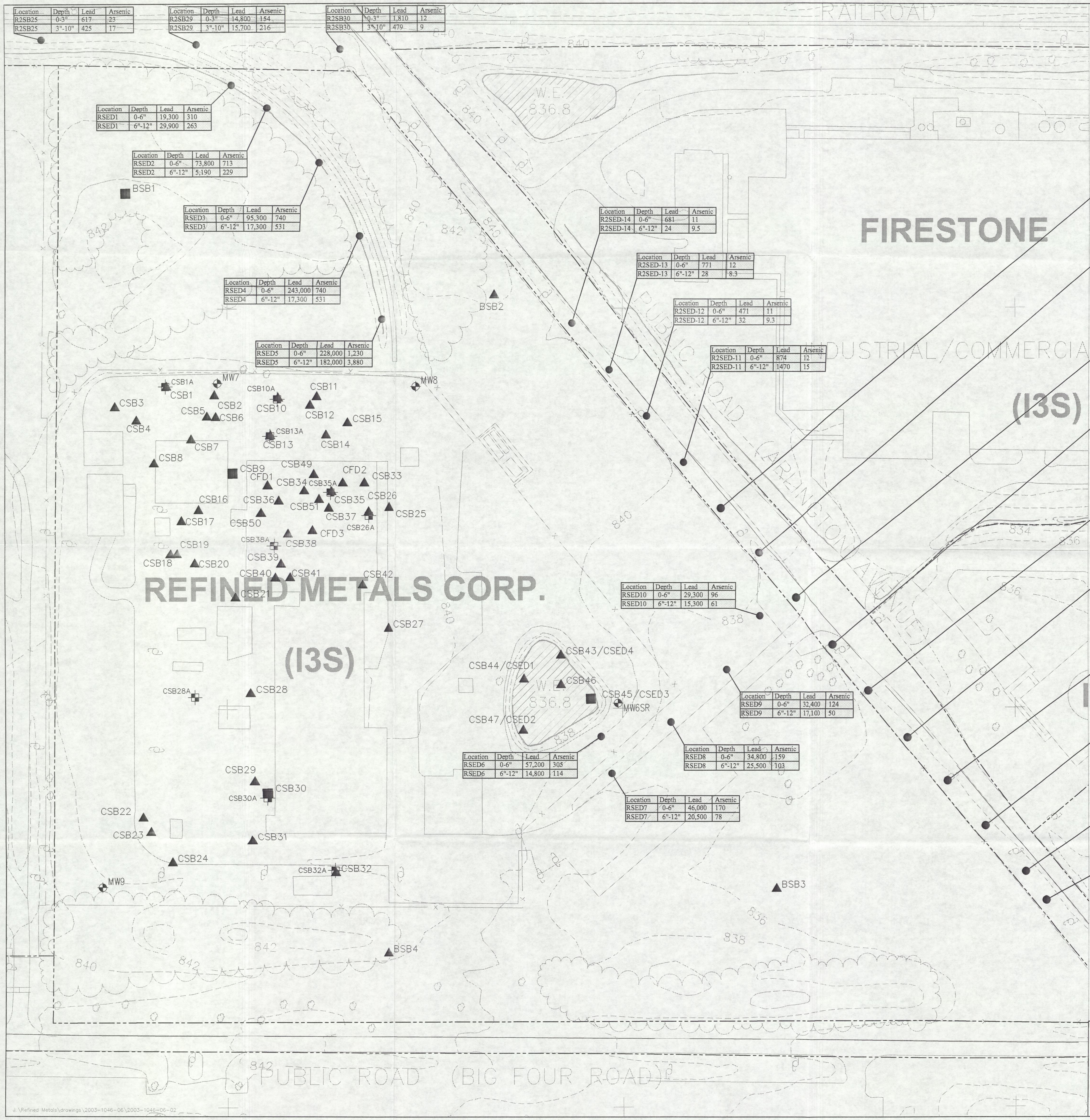
DRAWING: 1



Location	Depth	Lead	Arsenic
R2SB25	0-3"	617	23
R2SB25	3"-10"	425	17

Location	Depth	Lead	Arsenic
R2SB29	0-3"	14,800	154
R2SB29	3"-10"	15,700	216

Location	Depth	Lead	Arsenic
R2SB30	0-3"	1,810	12
R2SB30	3"-10"	479	9

Location	Depth	Lead	Arsenic
RSED1	0-6"	19,300	310
RSED1	6"-12"	29,900	263

Location	Depth	Lead	Arsenic
RSED2	0-6"	73,800	713
RSED2	6"-12"	5,190	229

Location	Depth	Lead	Arsenic
RSED3	0-6"	95,300	740
RSED3	6"-12"	17,300	531

Location	Depth	Lead	Arsenic
RSED4	0-6"	243,000	740
RSED4	6"-12"	17,300	531

Location	Depth	Lead	Arsenic
RSED5	0-6"	228,000	1,230
RSED5	6"-12"	182,000	3,880

Location	Depth	Lead	Arsenic
R2SED-14	0-6"	681	11
R2SED-14	6"-12"	24	9.5

Location	Depth	Lead	Arsenic
R2SED-13	0-6"	771	12
R2SED-13	6"-12"	28	8.3

Location	Depth	Lead	Arsenic
R2SED-12	0-6"	471	11
R2SED-12	6"-12"	32	9.3

Location	Depth	Lead	Arsenic
R2SED-11	0-6"	874	12
R2SED-11	6"-12"	1470	15

Location	Depth	Lead	Arsenic
RSED10	0-6"	29,300	96
RSED10	6"-12"	15,300	61

Location	Depth	Lead	Arsenic
RSED9	0-6"	32,400	124
RSED9	6"-12"	17,100	50

Location	Depth	Lead	Arsenic
RSED8	0-6"	34,800	159
RSED8	6"-12"	25,500	103

Location	Depth	Lead	Arsenic
RSED6	0-6"	57,200	305
RSED6	6"-12"	14,800	114

Location	Depth	Lead	Arsenic
RSED7	0-6"	46,000	170
RSED7	6"-12"	20,500	78

SAMPLE ID	Lead	Arsenic
R2SED-1A	1210 U	10
R2SED-1B	1550	14
R2SED-1C	19 J	10
R2SED-1D	62 J	5.5

SAMPLE ID	Lead	Arsenic
R2SED-2A	1230 U	10
R2SED-2B	955 U	11

SAMPLE ID	Lead	Arsenic
R2SED-3A	1570	12
R2SED-3B	6020 U	9.3
R2SED-3C	622 J	13
R2SED-3D	691 J	12

SAMPLE ID	Lead	Arsenic
R2SED-4A	2480 U	20
R2SED-4B	1570	17

SAMPLE ID	Lead	Arsenic
R2SED-5A	5410	46
R2SED-5B	1240	20
R2SED-5C	73 J	5.7
R2SED-5D	20 J	7.3

SAMPLE ID	Lead	Arsenic
R2SED-6A	8430	44
R2SED-6B	3840	35

SAMPLE ID	Lead	Arsenic
R2SED-7A	5480	39
R2SED-7B	2340	26
R2SED-7C	61 J	13
R2SED-7D	27 J	9.2

SAMPLE ID	Lead	Arsenic
R2SED-8A	8190	36
R2SED-8B	2610	23

SAMPLE ID	Lead	Arsenic
R2SED-9A	3630	29
R2SED-9B	471	11
R2SED-9C	25 J	8.9
R2SED-9D	39 J	8.2

SAMPLE ID	Lead	Arsenic
R2SED-10A	84	9.4
R2SED-10B	25	7.2

N E S W

LEGEND

▲ SAMPLE LOCATION/DESIGNATION SURVEYED BY THE SCHNIEDER CORP., INDIANAPOLIS, IN, OCTOBER 1999

■ APPROXIMATE SAMPLE LOCATION–NOT SURVEYED

MONITORING WELL LOCATION/DESIGNATION SURVEYED BY THE SCHNIEDER CORP., INDIANAPOLIS, IN

SAMPLE LOCATION/DESIGNATION SURVEYED BY THE SCHNIEDER CORP., INDIANAPOLIS, IN, DECEMBER 2001

● SED SAMPLE LOCATION/DESIGNATION SURVEYED BY THE SCHNIEDER CORP., INDIANAPOLIS, IN

60 0 60 120
SCALE IN FEET

REFINED METALS CORPORATION
CORRECTIVE MEASURES STUDY PHASE 2 REPORT
BEECH GROVE, IN

Scale: 1"=60'	SEDIMENT SAMPLE LOCATIONS		DRAWING: 2
Originated By: P.G.S.			
Drawn By: P.S.G.			
Checked By: J.W.DJ.			
Project Mgr.: P.G.S.	ADVANCED GeoServices Engineering for the Environment. Planning for People.™	1055 Andrew Drive Suite A West Chester, Pennsylvania 19380 (610) 840-9100 FAX: (610) 840-9199	
Project No.: 2003-1046-06			
Dwg No. 2003-1046-06-02			
Issued: AUG 0 6 2007			

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REFINED METALS CORPORATION
CORRECTIVE MEASURES STUDY PHASE 2 REPORT
BEECH GROVE, IN

Scale:	1"=60'
Originated By:	P.G.S.
Drawn By:	P.S.G.
Checked By:	J.W.DJ.
Project Mgr.:	P.G.S.
Project No.:	2003-1046-06
Dwg No.	2003-1046-06-03
Issued:	AUG 0 6 2007

SOIL SAMPLE LOCATIONS

ADVANCED GeoServices
Engineering for the Environment. Planning for People.™

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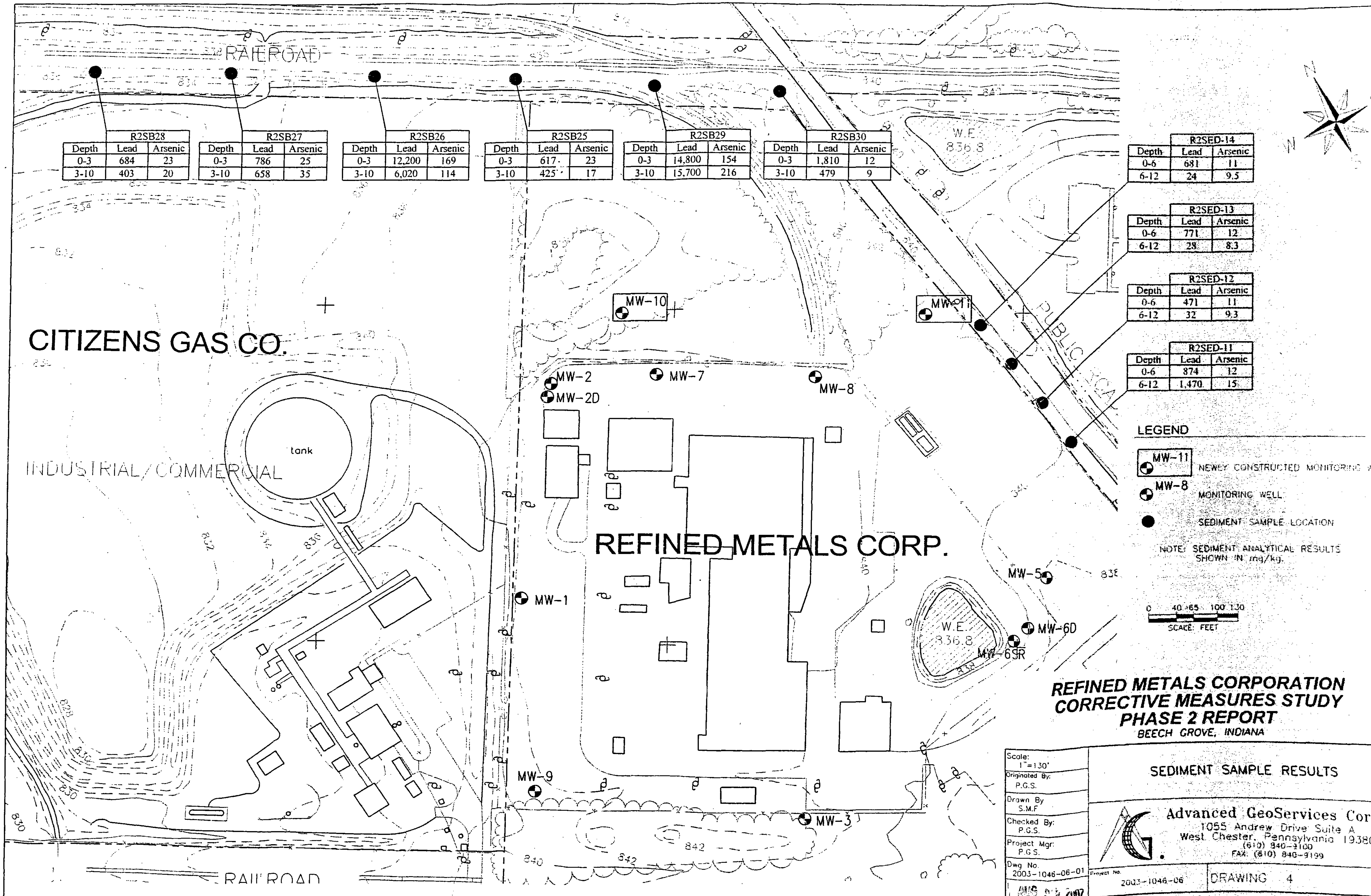
DRAWING: 3

DRAWINGS



	R2SB28	
Depth	Lead	Arsenic
0-3	684	23
3-10	403	20

	R2SB27	
Depth	Lead	Arsenic
0-3	786	25
3-10	658	35

	R2SB26	
Depth	Lead	Arsenic
0-3	12,200	169
3-10	6,020	114

	R2SB25	
Depth	Lead	Arsenic
0-3	617	23
3-10	425	17

	R2SB29	
Depth	Lead	Arsenic
0-3	14,800	154
3-10	15,700	216

	R2SB30	
Depth	Lead	Arsenic
0-3	1,810	12
3-10	479	9

	R2SED-14	
Depth	Lead	Arsenic
0-6	681	11
6-12	24	9.5

	R2SED-13	
Depth	Lead	Arsenic
0-6	771	12
6-12	28	8.3

	R2SED-12	
Depth	Lead	Arsenic
0-6	471	11
6-12	32	9.3

	R2SED-11	
Depth	Lead	Arsenic
0-6	874	12
6-12	1,470	15

REFINED METALS CORPORATION
CORRECTIVE MEASURES STUDY
PHASE 2 REPORT
BEECH GROVE, INDIANA

Scale: 1"=130'
Originated By: P.G.S.
Drawn By S.M.F
Checked By: P.G.S.
Project Mgr: P.G.S.
Dwg No. 2003-1046-06-01
AUG 0 5 2007

SEDIMENT SAMPLE RESULTS

Advanced GeoServices Corp.
1055 Andrew Drive Suite A
West Chester, Pennsylvania 19380
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FAX: (610) 840-9199

Project No. 2003-1046-06
DRAWING 4

APPENDIX A

Baseline Human Health Risk Assessment

Baseline Human Health Risk Assessment for

Refined Metals Corporation Facility

Beech Grove, Indiana

Conducted as Part of the

Phase I Corrective Measures Study

Prepared for
Refined Metals Corporation
3000 Montrose Ave.
Reading, PA 19605-2751

Prepared by
Gradient Corporation
20 University Road
Cambridge, MA 02138

May 5, 2005

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1 Introduction

1.1 Site Description and History

The Refined Metals Corporation (RMC) facility is located at 3700 South Arlington Avenue in Beech Grove, Indiana. Secondary lead smelting and refining operations were conducted at this site from 1968 to the end of 1995.

The site occupies approximately 24 acres, of which approximately 10 acres represented the active manufacturing area (including paved areas and buildings). The remaining 14 acres includes grassed and wooded site areas. The site is bordered by Arlington Avenue to the east, a natural gas facility (Citizen's Gas) to the west, a railroad to the north, and Big Four Road to the south (Figure 1). The site is relatively flat with less than 10 feet of total relief. Natural site drainage is toward the north and east. The former manufacturing area is almost completely paved, and is characterized by nearly 80,000 square feet of structures consisting of the battery breaker, a wastewater treatment plant, material storage areas, a blast furnace, a dust furnace, a metals refining area, warehouse and offices.

A total of five exposure areas were evaluated (Figure 1). One onsite area was the fenced main plant area of the RMC facility, consisting of the plant buildings and surrounding paved areas. The second onsite area was the grassy area to the north, east, and south of the paved facility area. Within the grassy area, the two ditches where sediments were collected (Figure 1) were evaluated separately for certain receptors. Three areas were evaluated offsite: a strip along Arlington Avenue, just outside the eastern border of the RMC facility; the Railroad Ditch along the northern border of the RMC facility, and the Citizen's Gas property to the west of the RMC facility.

1.2 Previous Investigations

On July 14, 1998, RMC entered into a Consent Decree with the United States Environmental Protection Agency (USEPA) and the Indiana Department of Environmental Management (IDEM). Under this Consent Decree, a RCRA Facility Investigation (RFI) was performed to evaluate and determine the nature and extent of releases and to collect information necessary to support risk assessment so that a Corrective Measures Study may be implemented. Pursuant to Section VI, Paragraph 42 of the Consent Decree (Compliance Requirements for Corrective Action), Advanced GeoServices Corp. (AGC) performed the RFI in accordance with an approved RFI work plan on behalf of RMC. The preparation and implementation of the RFI work plans were enacted in accordance with Exhibit B of the Consent Decree and the EPA's RCRA Facility Investigation Guidance Document (EPA 530/SW-89-031). The RFI was conducted in multiple phases. The results from the initial phase of sampling were presented in the Phase I RFI Report dated August 31, 2000 (AGC, 2000). Based on the results of the Phase I RFI a Phase II RFI Work Plan was submitted to the EPA on December 20, 2000. In response to comments on the Phase II RFI Work Plan issued by the EPA on April 3, 2001, revisions to the Phase II RFI Work Plan were submitted to the EPA on June 27, 2001. The EPA approved the Phase II RFI Work Plan on July 13, 2001, the results of which were contained in the Final Phase II RFI Report dated February 4, 2003. (AGC, 2003). Additional site sampling was conducted during a closure investigation to address three former RCRA-regulated solid waste managements units (SWMUs). The results of the SWMU closure investigation were presented by AGC in the Closure Investigation Report dated June 1, 2001.

1.3 Report Objectives and Organization

This report presents the results of the baseline human health risk assessment (HHRA) that was conducted to evaluate potential human health risks in each exposure area. The purpose of this evaluation is to determine whether these areas pose any unacceptable health risks or if they require remediation to reduce risk to acceptable levels.

The remainder of this report is organized in the following sections. Section 2 discusses the data used in the risk assessment, and the constituents of potential concern. Section 3 discusses the potential receptors, exposure media, and exposure pathways for each exposure area. Section 4 presents the toxicity assessment. Section 5 presents the risk characterization. Section 6 presents soil lead cleanup levels. Section 7 presents the conclusions for all scenarios evaluated.

2 Constituents of Potential Concern

The results of the Phase I RFI indicated that lead and arsenic are the main contaminants of concern in soil, both onsite and offsite. Lead and arsenic were detected in soil samples from the site at concentrations above both residential and industrial risk-based concentrations (RBCs). The baseline risk assessment retained lead and arsenic as chemicals of potential concern (COPCs) in soil.

3. Exposure Assessment

3.1 Potential Receptors and Exposure Pathways

The potential receptors, exposure media, exposure pathways, and exposure frequencies evaluated in each exposure area are presented in Table 1, and are discussed in more detail below. Exposure Areas are shown in Figure 1.

Table 1
Receptors and Exposure Pathways

Exposure Area	Media	Depth	Exposure Pathways	Receptors	Exposure Frequency (days/year)	Exposure Duration (years)
Plant Area	Subsurface soil	0-5 ft	Ingestion, Dermal Contact	Construction Worker 1	50	5
				Construction Worker 2	250	1
				Utility Worker	10	10
Grassy Area	Soil and Sediment	0-6"	Ingestion, Dermal Contact	Groundskeeper	50	25
				Future Site Worker	144	25
	Soil and Sediment	0-5 ft	Ingestion, Dermal Contact	Construction Worker 1	50	5
				Construction Worker 2	250	1
	Sediment	0-6"	Ingestion, Dermal Contact	Adolescent Trespasser	21	5
	Soil	0-6"		Adolescent Trespasser	21	5
Arlington Avenue	Sediment	0-3"	Ingestion, Dermal Contact	Adolescent Recreator	42	5
Railroad Ditch	Sediment	0-3"	Ingestion, Dermal Contact	Adolescent Recreator	42	5
Off Site Natural Gas Facility	Surface soil	0-6"	Ingestion, Dermal Contact	Adult Worker	225	25

3.1.1 Facility Area

The plant buildings and surrounding paved areas occupy approximately the central third of the RMC property. The site is largely paved – the only exposed surface soil is limited to a strip along the western fence line. In this exposure area, we evaluated a utility worker and two types of construction workers who could be exposed to subsurface soil. Both the utility and construction workers are assumed to be exposed to subsurface soil at depths from 0 to 5 feet, *via* incidental ingestion and dermal contact. The utility worker is assumed to have an exposure frequency of 10 days/year and an exposure duration of 10 years. Construction Worker 1 is assumed to have an exposure frequency of 50 days/year for 5 years; this scenario assumes that Exide retains the property, and represents a worker assigned to several small projects per year over a 5 year period. Construction Worker 2 is assumed to have an exposure frequency of 250 days/year for 1 year; this scenario assumes that Exide sells the property, and the property undergoes one year of redevelopment involving subsurface excavation.

3.1.2 Grassy Area North, South, and East of Main Facility

The grassy and wooded areas located north, south, and east of the main facility encompass approximately the northern and southern thirds of the RMC property (Figure 1). The receptors evaluated in both of these areas include an adolescent trespasser and an adult groundskeeper under current use, a future site worker, and two types of construction workers who could be exposed to subsurface soil. A future site worker might be present in the grassy area if the property were sold and the grassy area was not redeveloped. These receptors are assumed to be exposed to soil and/or sediment *via* incidental ingestion and dermal contact. The adolescent trespasser (age 13-18 years) is assumed to have an exposure frequency of 21 days/year and an exposure duration of 5 years. The groundskeeper is assumed to have an exposure frequency of 50 days/year and an exposure duration of 25 years. A future site worker is assumed to spend most of his time in the plant and surrounding paved areas. However, he may have occasion to visit the grassy/wooded areas for a walk or to eat lunch at a picnic table. The future site worker is assumed to have an exposure frequency in these areas of 4 days/week for 36 weeks/year or 144 days/year, and an exposure duration of 25 years. Construction Worker 1 is assumed to have an exposure frequency of 50 days/year for 5 years; this scenario assumes that Exide retains the property, and represents a worker assigned to several small projects per year over a 5 year period. Construction Worker 2 is assumed to have an exposure frequency of 250 days/year for 1 year; this scenario assumes that Exide sells the property, and the property undergoes one year of redevelopment involving subsurface excavation.

3.1.3 Offsite Natural Gas Facility

At the offsite natural gas facility, an adult commercial worker was evaluated. The worker is assumed to be exposed to surface soil *via* incidental ingestion and dermal contact. The worker is assumed to have an exposure frequency in these areas of 5 days/week for 45 weeks/year, or 225 days/year, and an exposure duration of 25 years.

3.1.4 Arlington Avenue

In the strip along Arlington Avenue outside the eastern border of the facility, an adolescent recreator was evaluated. The recreator is assumed to be exposed to sediment *via* incidental ingestion and dermal contact for 42 days/year. The adolescent recreator is 13-18 years old, therefore his exposure duration is 5 years.

3.1.5 Railroad Ditch

In the Railroad Ditch area along the northern border of the RMC facility, an adolescent recreator was evaluated. The recreator is assumed to be exposed to sediment *via* incidental ingestion and dermal contact for 42 days/year. The adolescent recreator is 13-18 years old, therefore his exposure duration is 5 years.

3.2 Exposure Point Concentrations

In a risk assessment, an Exposure Point Concentration (EPC) represents the concentration of a chemical in an environmental medium to which an individual is exposed. The calculation of EPCs is described below. The EPCs used in this risk evaluation are presented in Table 2. The datasets used and the EPC calculations are presented in Appendix B for lead and Appendix C for arsenic.

Table 2
Exposure Point Concentrations

Exposure Area	Receptor	Media	Depth	Arsenic 95%UCL mg/kg	Arsenic 95%UCL Basis	Lead Mean mg/kg
Onsite	Construction Worker 1 & 2, Utility Worker	Soil	0-5 ft	123	NP, Bootstrap	20,266
Grassy Area	Groundskeeper, Future Site Worker	Soil and Sediment	0-6 in	779	NP, Chebyshev 99% UCL	20,158
	Construction Worker 1 & 2	Soil and Sediment	0-30 in	818	NP, Chebyshev 99% UCL	13,392
	Adolescent Trespasser	Soil	0-6 in	60	NP, Chebyshev 95% UCL	1,908
	Adolescent Trespasser	Sediment	0-6 in	1,387	Gamma UCL	89,100
Arlington Ave	Adolescent Recreator	Sediment	0-3 in	38	NP, Chebyshev 95% UCL	3,032
Railroad Ditch	Adolescent Recreator	Sediment	0-3 in	169	Max	5,150
Offsite Gas Facility	Worker	Soil	0-6 in	28.5	LN, H-UCL	1,311

NP Nonparametric
LN Lognormal

For arsenic, the EPCs were the 95% upper confidence level on the mean (95UCL) concentration. The 95UCL is used instead of the mean or arithmetic average because it is not possible to know the true mean (USEPA, 1992b). The 95UCL is defined as a value that ..."equals or exceeds the true mean 95% of the time" (USEPA, 1992b). As sampling data become more representative of actual site conditions, uncertainties decrease, and the 95UCL approaches the true mean. The 95UCL values were calculated with ProUCL© according to USEPA guidance (USEPA, 2002a).

To evaluate lead risks, the arithmetic mean soil lead concentration within the exposure area was used as the EPC to be consistent with USEPA guidance (USEPA, 1994; USEPA, 1996)

3.3 Quantification of Exposure

This section discusses the basis for calculating human intake levels resulting from exposures to COPCs other than lead (in this case arsenic), and describes each input parameter. Human intake levels for lead are discussed in Section 5. Exposure estimates represent the daily dose of a chemical taken into the body, averaged over the appropriate exposure period, expressed in the units of milligram (mg) of chemical per kilogram (kg) of human body weight per day. The primary source for the exposure equations used in the HHRA is the USEPA's "*Risk Assessment Guidance for Superfund* (RAGS)" (USEPA, 1989).[1] The generalized equation for calculating chemical intakes is shown below:

$$I = \frac{EPC \times CR \times EF \times ED}{BW \times AT}$$

where:

I	=	Intake, the amount of chemical at the exchange boundary (mg/kg body weight-day),
EPC	=	Exposure Point Concentration, the chemical concentration contacted over the exposure period at the exposure point (*e.g.*, mg/kg in soil),
CR	=	Contact Rate, the amount of contaminated medium contacted per unit time or event (*e.g.*, soil ingestion rate (mg/day)),
EF	=	Exposure Frequency, describes how often exposure occurs (days/year),
ED	=	Exposure Duration, describes how long exposure occurs (yr),
BW	=	Body Weight, the average body weight over the exposure period (kg), and
AT	=	Averaging Time, period over which exposure is averaged (days).

Exposure factors (*e.g.*, contact rate, exposure frequency, exposure duration, body weight) describe a receptor's exposure for a given exposure scenario. The values used for each exposure factor are summarized in Table 3 and discussed in detail below. The exposure factor input values are consistent with current USEPA guidance. Where appropriate, exposure parameters were based on site-specific considerations and professional judgment.

[1] Note that this approach is not used to evaluate lead. Consistent with USEPA guidance, lead exposure is evaluated using a child or adult lead model to estimate blood lead levels.

Table 3
Summary of Exposure Factor Input Values for Arsenic Risks

Exposure Area Medium Receptor	Onsite Soil Construction Worker 1	Onsite Soil Construction Worker 2	Onsite Soil Utility Worker	Grassy Area Soil/Sediment Grounds- keeper	Grassy Area Soil/Sediment Future Site Worker	Grassy Area Soil/Sediment Construction Worker 1
Exposure Pathway/Exposure Factor						
Ingestion of Soil						
Ingestion Rate (mg/day)	330	330	330	100	50	330
Exposure Duration (yr)	5	1	10	25	25	5
Exposure Frequency (days/yr)	50	250	10	50	144	50
Body Weight (kg)	70	70	70	70	70	70
Bioavailability (arsenic)	0.8	0.8	0.8	0.8	0.8	0.8
Conversion Factor (kg/mg)	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001
Fraction from Contaminated Source	1	1	1	1	1	1
Averaging Time (days) -- Cancer	25550	25550	25550	25550	25550	25550
Averaging Time (days) - Non Cancer	1825	365	3650	9125	9125	1825
Dermal Contact with Soil						
Dermal Absorption Factor (arsenic)	0.03	0.03	0.03	0.03	0.03	0.03
Soil Adherence Factor (mg/cm^2)	0.2	0.2	0.2	0.2	0.07	0.2
Surface Area (cm^2/d)	3300	3300	3300	3300	3300	3300
Exposure Duration (years)	5	1	10	25	25	5
Exposure Frequency (days/yr)	50	250	10	50	144	50
Body Weight (kg)	70	70	70	70	70	70
Conversion Factor (kg/mg)	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001
Fraction from Contaminated Source	1	1	1	1	1	1
Averaging Time (days) - Cancer	25550	25550	25550	25550	25550	25550
Averaging Time (days) - Non Cancer	1825	365	3650	9125	9125	1825

Table 3
Summary of Exposure Factor Input Values for Arsenic Risks (cont'd)

Exposure Area Medium Receptor	Grassy Area Soil/Sediment Construction Worker 2	Grassy Area Soil Adolescent Trespasser	Grassy Area Sediment Adolescent Trespasser	Arlington Ave. Sediment Adolescent Recreator	Railroad Ditch Sediment Adolescent Recreator	Offsite Gas Facility Soil Worker
Exposure Pathway/Exposure Factor						
Ingestion of Soil						
Ingestion Rate (mg/day)	330	50	50	50	50	50
Exposure Duration (yr)	1	5	5	5	5	25
Exposure Frequency (days/yr)	250	21	21	42	42	225
Body Weight (kg)	70	58	58	58	58	70
Bioavailability (arsenic)	0.8	0.8	0.8	0.8	0.8	0.8
Conversion Factor (kg/mg)	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001
Fraction from Contaminated Source	1	1	1	1	1	1
Averaging Time (days) – Cancer	25550	25550	25550	25550	25550	25550
Averaging Time (days) - Non Cancer	365	1825	1825	1825	1825	9125
Dermal Contact with Soil						
Dermal Absorption Factor (arsenic)	0.03	0.03	0.03	0.03	0.03	0.03
Soil Adherence Factor (mg/cm^2)	0.2	0.07	0.07	0.07	0.07	0.2
Surface Area (cm^2/d)	3300	4270	4270	4270	4270	3300
Exposure Duration (years)	1	5	5	5	5	25
Exposure Frequency (days/yr)	250	21	21	42	42	225
Body Weight (kg)	70	58	58	58	58	70
Conversion Factor (kg/mg)	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001
Fraction from Contaminated Source	1	1	1	1	1	1
Averaging Time (days) - Cancer	25550	25550	25550	25550	25550	25550
Averaging Time (days) - Non Cancer	365	1825	1825	1825	1825	9125

3.3.1 Ingestion of Soil

For the soil ingestion pathway intake is calculated as:

$$Intake\left(\frac{mg}{kg \cdot day}\right) = \frac{C_{soil}\left(\frac{mg}{kg}\right) \times B \times IR_{soil}\left(\frac{mg}{day}\right) \times FS \times EF\left(\frac{days}{yr}\right) \times ED(yrs) \times 10^{-6}\frac{kg}{mg}}{BW(kg) \times AT(days)}$$

where:

C_{soil}	=	Concentration of the chemical in soil (mg/kg)
B	=	Relative Bioavailability, the relative oral absorption fraction (unitless)
IR_{soil}	=	Soil Ingestion Rate (mg/day)
FS	=	Fraction of Soil from the site (unitless)
EF	=	Exposure Frequency (days/year)
ED	=	Exposure Duration (years)
BW	=	Body Weight (kg)
AT	=	Averaging Time (days)

Gradient used conservative USEPA-recommended values for each of the input parameters. The basis for each value used is detailed below.

Soil Concentrations (C_{soil}). As summarized in Section 3.2, the 95UCL was used as the EPC.

Relative Bioavailability (B). To accurately quantify potential exposures from ingestion of soil, it is important to consider the amount of a chemical that is solubilized in gastrointestinal fluids and absorbed across the gastrointestinal tract into the bloodstream. A chemical present in soil may be absorbed less completely than the same dose of the chemical administered in toxicity studies used to evaluate safe dose levels. A relative bioavailability estimate for a specific compound represents the absorption fraction from soil (the exposure route of concern) relative to the absorption fraction from food or water (in most toxicity studies, chemical doses are administered in food or water).

It is widely recognized that bioavailability of many metals and organics from soil tends to be considerably lower than bioavailability from food or water. USEPA guidance recognizes the need to make adjustments for the reduced bioavailability of compounds in soil. Specifically, in Appendix A of USEPA's Risk Assessment Guidance for Superfund (USEPA, 1989, pg. A-3), USEPA notes:

> If the medium of exposure in the site exposure assessment differs from the medium of exposure assumed by the toxicity value (*e.g.*, RfD values usually are based on or have

been adjusted to reflect exposure *via* drinking water, while the site medium of concern may be soil), an absorption adjustment may, on occasion, be appropriate. For example, a substance might be more completely absorbed following exposure to contaminated drinking water than following exposure to contaminated food or soil (*e.g.*, if the substance does not desorb from soil in the gastrointestinal tract).

USEPA Region 10 risk assessment guidance provides default values for the bioavailability of arsenic in soil. Region 10 notes that if the site is a smelter site and its appears likely that the arsenic exists primarily as finely-grained oxides from smelter stack emissions, then a value of 80% relative bioavailability may be assumed. Region 10 notes that this value is supported by a conservative interpretation of the scientific literature (USEPA Region 10, 1997). A relative bioavailability of 80% was used for arsenic in this risk assessment.

For lead, the USEPA recommends an oral absorption factor for adults of 0.12 for ingestion of lead in soil, based on 20% absorption of soluble lead, and a relative bioavailability of 60% for lead in soil (*i.e.*, $0.12 = 0.2 \times 0.6$) (USEPA, 1996). Gradient used the recommended USEPA absorption factor of 0.12 to evaluate ingestion of lead contaminated soil for adult receptors.

Soil Ingestion Rate (IR_{soil}). A daily soil and dust ingestion rate of 50 mg/day was used for the adolescent trespasser, adolescent recreator, site worker, and offsite gas facility worker. USEPA considers this value to be a reasonable central estimate of adult soil ingestion and notes that although this value is highly uncertain, "a recommendation for an upper percentile value would be inappropriate" (USEPA, 1997a). A daily soil and dust ingestion rate of 100 mg/day was used for the groundskeeper (USEPA, 2002b). A daily soil and dust ingestion rate of 330 mg/day was used for the onsite construction worker and the onsite utility worker, as these receptors are assumed to have more intensive contact with soil than the other adult receptors (USEPA, 2002b).

Fraction of Soil From the Site (FS). For all receptors, it was assumed that 100% of the individual's daily soil exposure occurred at the site. This assumption is likely to overestimate exposure to contaminated soil for workers, trespassers, and recreators because workers are assumed to be at the site for only 8 hours per day, and trespassers are likely present less than 2 hours per visit.

Exposure Frequency (EF) and Exposure Duration (ED). The exposure frequency and duration used for each receptor are discussed in Section 3.1.1 to 3.1.3. For the site worker, groundskeeper, and offsite gas worker, the exposure duration is 25 years. This is the 95^{th} percentile duration that an individual stays at any one workplace (USEPA, 1991). Hence, this assumption overestimates exposures for most workers, because the median occupational tenure of the working population has been estimated to be 6.6 years (USEPA, 1997a).

Body Weight (BW). Although the average U.S. adult body weight in the current Exposure Factors Handbook (USEPA, 1997a) is 71.8 kg, a mean adult body weight of 70 kg (USEPA, 1991) was used in the HHRA, so that the body weight would be consistent with that used in deriving the toxicity factors. Average body weight for the adolescent trespasser and recreator (13-18 year old) was calculated from data in USEPA's Exposure Factors Handbook and used in the HHRA (USEPA, 1997a).

Averaging Time (AT). For non-cancer risks, the averaging time was equal to the exposure duration multiplied by 365 days/year. For cancer risks, exposures were averaged over a 70-year average lifetime (USEPA, 1991). Although the current life expectancy for men and women in the U.S. is 76.7 years (USEPA, 1997a), a value of 70 years (25,550 days) was used to be consistent with the value used in deriving the toxicity factors.

3.3.2 Dermal Contact with Surface Soil

For dermal exposure to contaminants in soil, a dermal intake (the amount absorbed into the body) is calculated as (USEPA, 2004c):

$$Intake\left(\frac{mg}{kg \cdot day}\right) = \frac{C_{soil}\left(\frac{mg}{kg}\right) \times DA \times AF\left(\frac{mg}{cm^2}\right) \times SA\left(\frac{cm^2}{event}\right) \times EF\left(\frac{events}{yr}\right) \times ED(yrs) \times 10^{-6}\,\frac{kg}{mg}}{BW(kg) \times AT(days)}$$

where:

C_{soil}	=	Concentration of the chemical in soil (mg/kg),
DA	=	Dermal Absorption factor (unitless)
AF	=	Soil/skin Adherence Factor (mg/cm^2),
SA	=	Skin surface Area exposed (cm^2/exposure event),
EF	=	Exposure Frequency (exposure events/year),
ED	=	Exposure Duration (years),
BW	=	Body Weight (kg), and
AT	=	Averaging Time (days).

There are three parameters in this equation that are different from those discussed in the previous section (Section 3.3.1). Only those parameters unique to the dermal exposure equation, dermal absorption fraction (DA), the soil adherence factor (AF), and the skin surface area (SA), are discussed in this section.

Note that since absorbed doses are used for the dermal pathway, the toxicity criteria are adjusted so they apply to absorbed doses. This adjustment is discussed in more detail in the toxicity section (Section 4).

Dermal Absorption Fraction (DA). The dermal absorption fraction represents the amount of a chemical in contact with skin that is absorbed through the skin and into the bloodstream. The dermal absorption fraction for arsenic (0.03) was obtained from USEPA's dermal risk assessment guidance (USEPA, 2004c; Table 3.4).

Soil to Skin Adherence Factor (AF). The adherence factor relates the amount of soil that adheres to the skin per unit of surface area (USEPA, 2004c). Adherence factors vary depending on the properties of the soil, the part of the body, and the type of activity. Gradient used the 50th percentile weighted adherence factors from USEPA's dermal risk assessment guidance (USEPA, 2004c). The AF for utility workers (0.2 mg/cm^2) was used for the construction worker, utility worker, groundskeeper, and offsite gas facility worker. EPA's recommended AF for the residential adult (0.07 mg/cm^2) was used for the future site worker, adolescent trespasser, and adolescent recreator.

Skin Surface Area Exposed (SA). This parameter reflects the amount of skin that is available for exposure to soil. The skin surface areas used in the HHRA were 3300 cm^2 for the construction worker, utility worker, site worker, groundskeeper, and offsite gas facility worker, based on the face, hands, and forearms; and 4270 cm^2 for the trespasser and recreator, based on the face, hands, forearms, and lower legs. Surface areas were calculated using USEPA's Exposure Factors Handbook (USEPA, 1997a).

4 Toxicity Assessment

4.1 Overview of Toxicity Values

Gradient has evaluated potential cancer and non-cancer risks from exposure to arsenic using dose-response relationships for carcinogenicity (oral Cancer Slope Factors) and systemic toxicity (oral Reference Doses). Lead toxicity is discussed separately in Section 4.2. The primary source of toxicity values was the USEPA's Integrated Risk Information System (IRIS) (USEPA, 2004a). Toxicity values in IRIS undergo a rigorous peer review process and are generally considered to be of high quality. The toxicity factors used in the HHRA are summarized in Table 4.

Table 4
Toxicity Factors

Compound	RfD_{oral} (mg/kg-day)	Critical Effect	RfD Source	Uncertainty Factor	Oral Absorption	RfD_{dermal} (mg/kg-day)	CSF_{oral} (mg/kg-day)	CSF_{dermal} (mg/kg-day)
Arsenic	0.0003	Hyperpigmentation, keratosis and possible vascular complications	IRIS	3	95%	0.0003	1.5	1.5

4.1.1 Oral Reference Doses (RfD_{oral})

An RfD is an estimate of daily exposure that a sensitive population can experience over a lifetime with a negligible risk of systemic health effects. The USEPA derives RfDs by first identifying the highest dose level that does not cause observable adverse effects (*i.e.*, the No Observed-Adverse Effect Level, or NOAEL; USEPA, 1993). If a NOAEL was not identified, a Lowest Observed Adverse Effect-Level, or LOAEL, may be used. This dose level is then divided by uncertainty factors to calculate an RfD. An uncertainty factor of 100 is often used, to account for interspecies differences (if animal studies were used) and sensitive human subpopulations (*e.g.*, children and the elderly; USEPA, 1993). Additional uncertainty factors may be used, depending on the quality of the toxicological data.

4.1.2 Oral Cancer Slope Factors (CSF_{oral})

The CSF is an upper bound estimate of carcinogenic potency used to calculate risk from exposure to carcinogens, by relating estimates of lifetime average chemical intake to the incremental risk of an individual developing cancer over their lifetime (USEPA, 1992c). The CSFs recommended by the USEPA are conservative upper bound estimates, which means that the USEPA is reasonably confident that the "true" cancer risk does not exceed the estimated risk calculated using the CSF, and may be as low as zero.

4.1.3 Dermal Reference Doses (RfD_{dermal})

There are no USEPA-derived toxicity values based specifically on toxicity studies involving dermal exposures. In the absence of dermal-specific RfDs, oral toxicity factors are used, assuming that once a chemical is absorbed into the blood stream, the health effects are similar regardless of whether the route of exposure is oral or dermal. However, since oral toxicity criteria are based on the amount of a chemical *administered* per unit time and body weight (chemical intake), they need to be adjusted to be applicable to *absorbed* doses (dermal exposures are expressed as absorbed intake levels) (USEPA, 1989; 1992a; 2004c).

Since most RfDs are based on studies where a chemical is administered in food or water, this adjustment is made using the oral absorption efficiency for that chemical. If oral absorption is very high (almost 100%), then the absorbed dose is virtually the same as the administered dose, and no adjustment of the toxicity factor is necessary. If oral absorption is very low (*e.g.*, 5%), the absorbed dose is much smaller than the administered dose, and an adjustment of the toxicity criteria is necessary. For any given chemical, the USEPA recommends adjusting the oral toxicity factor for use in evaluating dermal risks only when the oral absorption for that chemical is less than 50%, to "obviate the need to make comparatively small adjustments in the toxicity value that would otherwise impart on the process a level of accuracy that is not supported by the scientific literature" (USEPA, 2004c).

For non-cancer effects, this adjustment is made by multiplying the oral RfD (for applied doses) by the oral absorption efficiency (*i.e.*, $RfD_{oral} \times Abs_{oral} = RfD_{dermal}$). For arsenic, the oral absorption efficiency is 95%, therefore no adjustment is necessary and the RfD_{dermal} is the same as the RfD_{oral} (Table 4).

4.1.4 Dermal Cancer Slope Factors (CSF_{dermal})

There are no USEPA-derived toxicity values specifically for cancer studies involving dermal exposures. In the absence of dermal-specific CSFs, oral CSFs are used, assuming that once a chemical is absorbed into the blood stream, the carcinogenic effect is similar regardless of whether the route of exposure is oral or dermal. However, since oral CSFs are based on the amount of a chemical *administered* per unit time and body weight (chemical intake), they need to be adjusted to be applicable to *absorbed* doses (dermal exposures are expressed as absorbed intake levels) (USEPA, 1989; 1992a; 2004c). For any given chemical, the USEPA recommends adjusting the oral CSF for use in evaluating dermal risks only when the oral absorption for that chemical is less than 50%, to "obviate the need to make comparatively small adjustments in the toxicity value that would otherwise impart on the process a level of accuracy that is not supported by the scientific literature" (USEPA, 2004c).

For cancer, this adjustment is made by dividing the oral CSF (for applied doses) by the oral absorption efficiency (*i.e.*, $CSF_{oral} / Abs_{oral} = CSF_{dermal}$), if the oral absorption efficiency is less than 50%. For arsenic, this value is 95%, therefore the CSF_{dermal} is the same as the CSF_{oral} (Table 4).

4.2 Toxicity Values for COPCs

The basis of the arsenic toxicity values is described in this section and summarized in Table 4. Lead toxicity is also discussed in this section because of the unique way exposure and risk are evaluated for this metal.

4.2.1 Arsenic

The toxicity criteria for arsenic were obtained from the USEPA IRIS database (USEPA, 2004a). The derivation of each of these values, and the scientific uncertainties concerning arsenic toxicity, are discussed below.

4.2.1.1 Arsenic RfD_{oral}

USEPA cites an RfD_{oral} for arsenic of 0.0003 mg/kg-day (USEPA, 2004a). The arsenic RfD_{oral} is based on increased incidence of hyperpigmentation, keratosis and possible vascular complications in a study of a large population (over 40,000 people) in Taiwan with chronic exposure to arsenic in drinking water and food (Tseng, 1977; Tseng *et al.*, 1968). The USEPA characterized a NOAEL of 0.0008 mg/kg/day for skin lesions in the Tseng study, based on the drinking water concentration in the NOAEL group (0.009 mg/L), an assumed drinking water ingestion rate of 4.5 L, daily arsenic intake from sweet potatoes and rice of 0.002 mg/day, and an average Taiwanese body weight of 55 kg ((0.009 mg/L × 4.5 L/day) + 0.002 mg/day / 55 kg) (Abernathy *et al.*, 1989). An uncertainty factor of 3 (based on the lack of reproductive toxicity data and uncertainty regarding toxicity in sensitive individuals) was applied to the NOAEL to derive an RfD of 0.0003 mg/kg/day (0.0008/3). Overall, the USEPA has "medium" confidence in the study, "medium" confidence in the database (due to poor characterization of the dose levels in the Tseng and other supporting studies), and "medium" confidence in the RfD_{oral} for arsenic. It is noted in the arsenic IRIS file that a clear consensus does not exist among USEPA scientists regarding arsenic systemic toxicity (USEPA, 2004a).

4.2.1.2 Arsenic CSF_{oral}

USEPA concluded that arsenic is a "human carcinogen," a weight-of-evidence classification for carcinogenicity of "A" (USEPA, 2004a). This classification is based on sufficient evidence of carcinogenicity in human populations. Lung cancer has been associated with inhalation of arsenic, and skin, bladder, and possibly other internal cancers have been associated with ingestion of arsenic in drinking water.

In IRIS, the USEPA recommends a CSF_{oral} value for arsenic of 1.5 $(mg/kg/day)^{-1}$ (USEPA, 2004a). This value is based on skin cancer incidence rates in the same Taiwanese study used as the basis for the RfD_{oral} value (Tseng, 1977; Tseng *et al.*, 1968). This value was calculated using a multistage model, assuming a drinking water ingestion rate of 3.5 L/day for Taiwanese males and 2 L/day for Taiwanese females, an average Taiwanese body weight of 55 kg, and an average U.S. body weight of 70 kg.

There is currently considerable debate among the scientific community regarding the arsenic CSF_{oral}. Many researchers believe that the current value of 1.5 $(mg/kg/day)^{-1}$ may overestimate cancer risks for U.S. populations (see, for example, Slayton *et al.*, 1996; Chappell *et al.*, 1997).

4.2.1.3 Arsenic RfD_{derm} and CSF_{derm}

In general, for dermal exposures (expressed as absorbed intake levels), the RfD_{oral} and CSF_{oral} are adjusted to be applicable to absorbed doses (USEPA, 1989; 1992a). This adjustment is made assuming that once a chemical is absorbed into the blood stream, the health effects are similar regardless of whether the route of exposure is oral or dermal. However, since oral absorption for arsenic is about 95% (USEPA, 2004c), and the USEPA recommends adjusting dermal toxicity factors only when oral absorption is less than 50%, no adjustment was made for arsenic.

4.2.2 Lead

The ingestion of lead at certain levels can result in significant health effects, particularly among children. Epidemiological investigators have reported a correlation between blood lead levels (BLLs) in children and adverse health effects. High levels of lead intake can cause kidney damage, convulsions, coma, and even death (ATSDR, 1999). However, health effects resulting from lower levels of lead exposure are more common, and are related to cognitive and neuro-behavior impacts, including the impairment of intellectual performance.

The USEPA has not established any toxicity criteria (RfD, CSF) for lead (USEPA, 2004b); instead, lead risks are evaluated by modeling blood lead levels. Lead risks in adults were evaluated using USEPA's Adult Lead Model (USEPA, 2003). This model is discussed in more detail in Section 5.4.

The USEPA has assigned lead a Weight-of-Evidence Classification for human carcinogenicity of "B2", a "probable human carcinogen," based on sufficient animal evidence but inadequate human evidence (USEPA, 2004b). Even though the weight of evidence for lead carcinogenicity is B2, the USEPA does not evaluate lead cancer risk using a CSF, having concluded that neurological effects in young children are the most relevant endpoint.

5 Risk Characterization

In this section, cancer and non-cancer health risks are estimated by combining the information from Sections 2 through 4. The calculations used to estimate cancer and noncancer risks are presented in Sections 5.1 and 5.2, respectively. Section 5.3 discusses the calculated cancer and noncancer risks for each exposure area. Section 5.4 presents the lead risks by exposure area. Section 5.5 provides a qualitative discussion of the most significant sources of uncertainty in the risk estimates.

5.1 Calculation of Cancer Risks

Excess lifetime cancer risks are characterized as the incremental probability that an individual will develop cancer during his or her lifetime due to chemical exposure to constituents at the site under the specific exposure scenarios evaluated. The term "incremental" implies the risk above the background cancer risk experienced by all individuals in the course of daily life. According to Greenlee *et al.* (2001), the lifetime probability of developing cancer (*i.e.*, background cancer risk) is approximately 0.435 in men, and 0.383 in women. Cancer risks are expressed as a unitless probability (*e.g.*, one in a million, or 10^{-6}) of an individual developing cancer over a lifetime, above background risk, as a result of exposure to impacted environmental media at a site.

Excess (incremental) cancer risks for all of the exposure pathways (oral, dermal, and inhalation) are calculated using intake estimates (lifetime average daily doses, calculated in Section 3 as part of the exposure assessment) and CSFs (summarized as part of the toxicity assessment in Section 4) as follows (USEPA, 1989):

$$CancerRisk = Intake\left(\frac{mg}{kg \cdot day}\right) \times CSF\left(\frac{mg}{kg \cdot day}\right)^{-1}$$

For ingestion pathways, oral intake estimates (expressed as applied or administered dose levels) are multiplied by the oral CSF (applicable to applied/administered doses). Similarly, for inhalation pathways, inhalation intake estimates (also expressed as applied or administered dose levels) are multiplied by the inhalation CSF (applicable to applied/administered doses). For dermal exposures, dermal intake estimates (expressed as an absorbed dose level) are multiplied by an adjusted oral CSF (adjusted to apply to absorbed doses) (USEPA, 2004c). The total cancer risk for each receptor is the sum of the risks across all of the exposure pathways.

5.2 Calculation of Noncancer Risks

Risks from non-carcinogenic health effects are expressed as hazard quotients rather than as probabilities. A hazard quotient compares the calculated exposure (average daily doses, calculated as part of the exposure assessment in Section 3) to acceptable reference exposures derived by the USEPA (*e.g.*, RfDs, summarized as part of the toxicity assessment in Section 4). The hazard quotient is calculated from the RfD as follows (USEPA, 1989):

$$Hazard\,Quotient = \frac{Intake\left(\frac{mg}{kg \cdot day}\right)}{RfD\left(\frac{mg}{kg \cdot day}\right)}$$

For the ingestion exposure route an oral intake estimate (expressed as applied or administered dose) is divided by the oral RfD (applicable to applied/administered dose). Similarly, for the inhalation exposure route an inhalation intake estimate (also expressed as applied or administered dose) is divided by the inhalation RfD (applicable to applied/administered dose). For dermal exposure, a dermal intake estimate (expressed as an absorbed dose) is divided by an adjusted oral RfD (adjusted to apply to absorbed dose).

Hazard indices are calculated for each receptor and exposure pathway, according to USEPA guidance (1989). A hazard index greater than 1.0 is considered to represent a significant health risk. Because a hazard quotient is simply a ratio of site exposures to reference exposure levels (*e.g.*, RfDs, RfCs, *etc.*), hazard indices do not represent the probability that an adverse health effect could occur. They simply indicate whether an estimated exposure for an individual presents a significant noncancer health risk, based on the USEPA's recommended reference dose.

5.3 Estimated Cancer and Noncancer Risks

The estimated cancer and noncancer risks for arsenic are discussed below by exposure area. Lead risks are discussed separately in Section 5.4. Cancer risks are summarized in Table 5. The total cancer risk for each receptor is the sum of the risks over all exposure routes and all exposure periods. Noncancer risks are also summarized in Table 5. The total noncancer risk for each receptor is the sum of the risks over all exposure routes. The detailed risk calculation tables in Appendix A present the arsenic risks calculated for each receptor and exposure pathway. The percent contribution of each exposure pathway to the total risk is also shown.

5.3.1 Main Facility Area

In the main facility area onsite, we evaluated two types of construction workers (Construction Workers 1 & 2) and a utility worker for exposure to arsenic in subsurface soil *via* incidental ingestion and dermal contact.

The total excess lifetime cancer risk is 7×10^{-6} for both construction workers, and 3×10^{-6} for the utility worker. These risk estimates are within USEPA's target risk range of 1×10^{-6} to 1×10^{-4}.

The total hazard index (HI) is 0.2 for Construction Worker 1, 1 for Construction Worker 2, and 0.05 for the utility worker. The remaining values are well below a HI of 1.0.

5.3.2 Grassy Area

In the grassy area located north, south, and east of the main facility, we evaluated a groundskeeper, a future site worker, two types of construction workers (Construction Workers 1 & 2), an adolescent trespasser exposed to soil, and an adolescent trespasser exposed to sediment. These receptors were assumed to be exposed to arsenic in soil or sediment *via* incidental ingestion and dermal contact.

The total excess lifetime cancer risks are 8×10^{-5} for the groundskeeper, 1×10^{-4} for the future site worker, 5×10^{-5} for both construction workers, 3×10^{-7} for the adolescent trespasser exposed to soil, and 7×10^{-6} for the adolescent trespasser exposed to sediment. These risk estimates are within or less than USEPA's target risk range of 1×10^{-6} to 1×10^{-4}.

The total hazard index (HI) is 0.5 for the groundskeeper, 0.7 for the future site worker, 2 for Construction Worker 1, 8 for Construction Worker 2, 0.01 for the adolescent trespasser exposed to soil, and 0.2 for the adolescent trespasser exposed to sediment. The two construction workers exceed a HI of 1.0. The other four receptors are below a HI of 1.0.

5.3.3 Arlington Avenue

In the Arlington Avenue area along the eastern border of the RMC property, we evaluated an adolescent recreator exposed to arsenic in surface sediment *via* incidental ingestion and dermal contact.

The total excess lifetime cancer risk for exposure to arsenic in sediment is 4×10^{-7} for the Arlington Avenue recreator. This risk estimate is below USEPA's target risk range of 1×10^{-6} to 1×10^{-4}.

The total hazard index (HI) for exposure to arsenic in sediment is 0.01 for the Arlington Avenue recreator. This value is well below a HI of 1.0.

5.3.4 Railroad Ditch

In the Railroad Ditch area along the northern border of RMC property, we evaluated an adolescent recreator exposed to arsenic in surface sediment *via* incidental ingestion and dermal contact.

The total excess lifetime cancer risk for exposure to arsenic in sediment is 2×10^{-6} for the Railroad Ditch recreator. This risk estimate is within USEPA's target risk range of 1×10^{-6} to 1×10^{-4}.

The total hazard index (HI) for exposure to arsenic in sediment is 0.05 for the Railroad Ditch recreator. This value is well below a HI of 1.0.

5.3.5 Offsite Natural Gas Facility

At the offsite natural gas facility to the west of the RMC property, we evaluated a facility worker exposed to arsenic in surface soil *via* ingestion and dermal contact.

The total excess lifetime cancer risk is 8×10^{-6} for the gas facility worker. This risk estimate is within USEPA's target risk range of 1×10^{-6} to 1×10^{-4}.

The total hazard index (HI) is 0.05 for the offsite gas facility worker. This value is well below a HI of 1.0.

Table 5
Summary of Cancer and Noncancer Risks

Exposure Area	Media	Receptors	Total Excess Lifetime Cancer Risk	Total Hazard Index
Plant Area	Soil	Construction Worker 1	7E-06	0.2
		Construction Worker 2	7E-06	1
	Soil	Utility Worker	3E-06	0.05
Grassy Area	Sediment	Adolescent Trespasser	7E-06	0.2
	Soil	Adolescent Trespasser	3E-07	0.01
	Soil and Sediment	Groundskeeper	8E-05	0.5
	Soil and Sediment	Future Site Worker	1E-04	0.7
		Construction Worker 1	5E-05	2
		Construction Worker 2	5E-05	8
Arlington Avenue	Sediment	Adolescent Recreator	4E-07	0.01
Railroad Ditch	Sediment	Adolescent Recreator	2E-06	0.05
Off Site Natural Gas Facility	Soil	Adult Worker	8E-06	0.05

5.4 Lead Risk Assessment

5.4.1 Adult Lead Model

Blood lead levels (BLLs) in adolescents and adults are assessed using USEPA's Adult Lead Model (ALM) (USEPA, 1996). USEPA's Adult Blood Lead Model predicts a median BLL estimate for an adult as a function of the baseline BLL plus an increment that is attributable to exposure to site soil. This increment is a function of the biokinetic slope factor, the concentration of lead in soil, the soil ingestion rate, the fraction of lead in soil that is absorbed, and the exposure frequency. EPA has selected a target BLL for an adult female, in order to protect a developing fetus such that no more than 5% of fetuses would be expected to have BLLs exceeding 10 µg/dL.

The basic form of the equation for the ALM is as follows:

$$BLL_{adult} = PbB + \frac{(EF \times AF \times PbS \times IR \times BKSF)}{AT}$$

The input values used in the model are summarized in Table 6 and described below. First, an average baseline lead concentration in blood (PbB_{base}) for adults is identified to account for continuing exposure to background levels of lead in food, soil, and dust, and pre-existing body burdens due to prior lead exposures. Baseline BLLs were obtained from the most recent National Health and Nutrition Examination Survey, from 1999-2000 (NHANES, 2000) (U.S. Public Health Service, 2004) (see Appendix E). For adults we used the geometric mean (GM) and geometric standard deviation (GSD) BLLs for women of childbearing age (age 20-49). For the adolescent trespasser, we used the GM and GSD BLLs for males and females combined, for 13-18 year olds. To this baseline, the model adds the incremental increase in blood lead due to the lead source of interest (in this case, exposure to lead *via* ingestion of soil).

The concentration of lead in soil (PbS) is the mean lead concentration in each exposure area. Lead uptake is calculated by multiplying the concentration of lead in soil by the soil ingestion rate (IR) and the absorption fraction (AF) for lead in soil. The AF is the amount of lead that is absorbed into the bloodstream from the gastrointestinal tract. The exposure frequency (EF) varies by receptor and exposure area. The EFs used for each receptor are presented in Table 3. The averaging time (AT) for chronic exposure to lead in soil is assumed to be one year (*i.e.*, 365 days). The biokinetic slope factor (BKSF) relates the incremental lead uptake into the body to an incremental increase in blood lead level in adults. USEPA's default value of 0.4 was used for the BKSF.

Table 6
Adult Lead Model Input Values

Term	Definition	Value
PbB_0	Geomean baseline BLL (µg/dL) for Adult females (age 20-49 yr) from NHANES 2000	1.2
GSD	Geometric standard deviation for Adult females	1.8
PbB_0	Geomean baseline BLL (µg/dL) for 13-18 yr old males and females	1.1
GSD	Geometric standard deviation for 13-18 yr old males and females	1.8
EF	Exposure Frequency (*i.e.*, number of days during the averaging time an individual is exposed to the lead source being evaluated (days))	Receptor-specific
AT	Averaging Time (days)	365
PbS	Soil lead concentration (µg/g)	Area-Specific
IR	Soil Ingestion Rate (g/day)	Receptor-specific 0.05 or 0.10
AF	Fraction of ingested lead absorbed into the blood stream (dimensionless)	0.12
BKSF	Biokinetic Slope Factor (change in blood lead per µg change in daily lead uptake) (µg/dL per µg/day)	0.4

Total BLLs for adults are predicted by adding the estimated incremental increase in blood lead to the average baseline BLL. A geometric standard deviation (GSD) appropriate for adults is used to estimate the probable range of BLLs around the predicted geometric mean adult BLL from the model. For this evaluation, we used the actual GSDs for the BLLs obtained from the NHANES-2000 database.

BLLs estimated using the ALM are evaluated based on a comparison to the USEPA risk management criterion for lead. Specifically, the health protection goal of the USEPA Office of Solid Waste and Emergency Response is to "limit exposure to soil lead levels such that a typical (or hypothetical) child or group of similarly exposed children would have an estimated risk of no more than 5% of exceeding a blood lead of 10 µg/dL" (USEPA, 1998). The Centers for Disease Control (CDC) recommend that "the goal of all lead poisoning prevention activities should be to reduce children's BLLs below 10 µg/dL" (CDC, 1991). Based on a goal of keeping the BLL in children at or below 10 µg/dL, the BLL for women of child-bearing age should not exceed 11.1 µg/dL, because the fetal BLL is approximately 90% of the maternal BLL (*i.e.*, 90% of 11.1 µg/dL is 10 µg/dL). A BLL goal of 10 µg/dL was used for the adolescent trespasser.

The adult lead modeling results for all receptors, along with the input values, the predicted BLLs, and the probability of exceeding the target BLL, are presented in Table 7. The adult lead modeling results are discussed below by exposure area. The dermal exposure route for lead in soil was not evaluated because this exposure route is typically insignificant when compared to ingestion. The ALM makes no provision for assessing dermal exposures.

Table 7
Summary of Lead Risks and Cleanup Goals

Exposure Variable	PbB Equation[1] 1*	PbB Equation[1] 2**	Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario: Onsite – Construction Worker 1	Onsite – Construction Worker 2	Onsite – Utility Worker	Grassy Area – Grounds-keeper	Grassy Area – Worker	Grassy Area – Construction Worker 1
			Exposure Medium		Soil	Soil	Soil	Soil/Sed	Soil/Sed	Soil/Sed
			Soil Exposure Depth		0-5 ft	0-5 ft	0-5 ft	0-6"	0-6"	0-30"
PbS	X	X	Soil lead concentration	ug/g or ppm	20,266	20,266	20,266	20,158	20,158	13,392
$R_{fetal/maternal}$	X	X	Fetal/maternal PbB ratio	–	0.9	0.9	0.9	0.9	0.9	0.9
BKSF	X	X	Biokinetic Slope Factor	ug/dL per ug/day	0.4	0.4	0.4	0.4	0.4	0.4
GSD_i	X	X	Geometric standard deviation PbB	–	1.8	1.8	1.8	1.8	1.8	1.8
PbB_0	X	X	Baseline PbB	ug/dL	1.2	1.2	1.2	1.2	1.2	1.2
IR_S	X		Soil ingestion rate	g/day	0.100	0.100	0.100	0.050	0.050	0.100
IR_{S+D}		X	Total ingestion rate of outdoor soil and indoor dust	g/day	–	–	–	–	–	–
W_S		X	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	–	–	–	–	–	–	–
K_{SD}		X	Mass fraction of soil in dust	–	–	–	–	–	–	–
$AF_{S,D}$	X	X	Absorption fraction	–	0.12	0.12	0.12	0.12	0.12	0.12
$EF_{S,D}$	X	X	Exposure frequency	days/yr	50	250	10	50	144	50
$AT_{S,D}$	X	X	Averaging time	days/yr	365	365	365	365	365	365
PbB_{adult}			PbB of adult worker, geometric mean	ug/dL	15	68	3.9	7.8	28	10
$PbB_{fetal,0.95}$			95th percentile PbB among fetuses of adult workers	ug/dL	34	161	9.1	19	48	24
PbB_t			Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0	10.0	10.0	10.0	10.0	10.0
$P(PbB_{fetal} > PbB_t)$			Probability that fetal PbB > PbB_t, assuming lognormal distribution	%	68%	100%	4%	28%	85%	43%
PRG			Preliminary Remediation Goal (PRG)	mg/kg	4601	920	–	9201	3195	4601
RAL			Remedial Action Level	mg/kg	78,900	8,470	–	73,900	16,665	43,300

Footnotes:
Construction Worker 1 is as described in the risk assessment work plan, i.e., short-term projects spread out over a 5 year period.
Construction Worker 2 presupposes redevelopment of the property including a year-long excavation/construction scenario for new buildings.

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Table 7
Summary of Lead Risks and Cleanup Goals (cont'd)

Exposure Variable	PbB Equation[1] 1*	PbB Equation[1] 2**	Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario: Grassy Area, Construction Worker 2	Grassy Area, Trespasser	Grassy Area, Trespasser	Arlington Ave, Recreator	Railroad Ditches, Recreator	Offsite Gas Facility, Worker
			Exposure Medium		Soil/Sed	Soil	Sediment	Sediment	Sediment	Soil
			Soil Exposure Depth		0-30"	0-6"	0-6"	0-3"	0-3"	0-6"
PbS	X	X	Soil lead concentration	ug/g or ppm	13,392	1,908	89,100	3032	5150	1311
$R_{fetal/maternal}$	X	X	Fetal/maternal PbB ratio	–	0.9	0.9	0.9	0.9	0.9	0.9
BKSF	X	X	Biokinetic Slope Factor	ug/dL per ug/day	0.4	0.4	0.4	0.4	0.4	0.4
GSD_i	X	X	Geometric standard deviation PbB	–	1.8	1.8	1.8	1.8	1.8	1.8
PbB_0	X	X	Baseline PbB	ug/dL	1.2	1.1	1.1	1.1	1.1	1.2
IR_S	X		Soil ingestion rate	g/day	0.100	0.050	0.050	0.050	0.050	0.050
IR_{S+D}		X	Total ingestion rate of outdoor soil and indoor dust	g/day	–	–	–	–	–	–
W_S		X	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	–	–	–	–	–	–	–
K_{SD}		X	Mass fraction of soil in dust	–	–	–	–	–	–	–
$AF_{S,D}$	X	X	Absorption fraction	–	0.12	0.12	0.12	0.12	0.12	0.12
$EF_{S,D}$	X	X	Exposure frequency	days/yr	250	21	21	42	42	225
$AT_{S,D}$	X	X	Averaging time	days/yr	365	168	168	168	168	365
PbB_{adult}			PbB of adult worker, geometric mean	ug/dL	45	1.7	27.8	2.9	4.2	3.1
$PbB_{fetal,0.95}$			95th percentile PbB among fetuses of adult workers	ug/dL	107	4.0	65.9	6.9	9.9	7.4
PbB_t			Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	10.0	10.0	10.0	10.0	10.0	10.0
$P(PbB_{fetal} > PbB_t)$			Probability that fetal PbB > PbB_t, assuming lognormal distribution	%	99%	0.1%	94%	1%	5%	2%
PRG			Preliminary Remediation Goal (PRG)	ppm	920	–	10,417	–	–	–
RAL			Remedial Action Level		4,954	–	34,000	–	–	–

Footnotes: Construction Worker 1 is as described in the risk assessment work plan, i.e., short-term projects spread out over a 5 year period.
Construction Worker 2 presupposes redevelopment of the property including a year-long excavation/construction scenario for new buildings.
Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

5.4.2 Main Facility Area

In the main facility area, lead risks were evaluated for two types of construction workers and a utility worker exposed to subsurface soil (0-5 ft). The predicted 95th percentile fetal BLLs are 34 µg/dL for Construction Worker 1, 161 µg/dL for Construction Worker 2, and 9.1 µg/dL for the utility worker. The predicted BLL for the fetus of both construction workers exceeds the BLL goal of 10 µg/dL, thus lead in subsurface soil poses an unacceptable risk in the main facility area. The exceedance is due to the elevated subsurface soil EPC of 20,266 mg/kg, which represents the average concentration for depths of 0-5 ft across the site. The utility worker has a much lower exposure frequency than the construction worker, thus his predicted 95th percentile BLL is below the adult 95th percentile goal of 10 µg/dL.

5.4.3 Grassy Area

In the grassy area, lead risks were evaluated for a future site worker, a groundskeeper, two types of construction workers, an adolescent trespasser exposed to surface soil, and an adolescent trespasser exposed to sediment. The predicted 95th percentile fetal BLLs are 19 µg/dL for the groundskeeper, 48 µg/dL for the future site worker, 24 µg/dL for Construction Worker 1, 107 µg/dL for Construction Worker 2, 4 µg/dL for the trespasser exposed to soil, and 66 µg/dL for the trespasser exposed to sediment. The predicted fetal BLLs for all receptors except for the trespasser exposed to lead in soil exceed the BLL goal of 10 µg/dL, thus lead in soil and sediment poses an unacceptable risk in this exposure area.

5.4.4 Arlington Avenue

In the Arlington Avenue area, lead risks were evaluated for an adolescent recreator exposed to surface sediment. The predicted 95th percentile fetal BLL is 6.9 µg/dL for this adolescent recreator. The predicted BLL is below the goal of 10 µg/dL, therefore, lead does not pose a significant risk to a recreator exposed to surface sediment in this exposure area.

5.4.5 Railroad Ditch

In the Railroad Ditch area, lead risks were evaluated for an adolescent recreator exposed to surface sediment. The predicted 95th percentile fetal BLL is 9.9 µg/dL for this adolescent recreator. The predicted BLL is below the goal of 10 µg/dL, therefore, lead does not pose a significant risk to a recreator exposed to surface sediment in this exposure area.

5.4.6 Offsite Natural Gas Facility

At the offsite natural gas facility, lead risks were evaluated for an offsite worker exposed to surface soil. The predicted 95th percentile fetal BLL is 7.4 μg/dL for the offsite worker. The predicted BLL is below the goal of 10 μg/dL, therefore, lead does not pose a significant risk to a worker exposed to surface soil in this exposure area.

5.5 Uncertainty Analysis

The process of evaluating human health risks involves multiple steps. Inherent in each step of the process are uncertainties that ultimately affect the final risk estimates. Uncertainties may exist in numerous areas, including sample collection, laboratory analysis, derivation of toxicity values, and estimation of potential site exposures. These uncertainties may result in either an over- or under-estimation of risks. However, for this risk assessment, where uncertainties existed, Gradient took a conservative approach in regards to parameters, assumptions, and methodologies, so as to overestimate potential exposures and risks. The most important contributors to uncertainty in this risk assessment are discussed below.

5.5.1 Uncertainties in Exposure Assessment

Soil Ingestion Rate. Lead risks were evaluated for onsite workers and grassy area construction workers using a soil ingestion rate of 0.10 g/day while all other receptors were evaluated using the 0.05 g/day default. The lead risks use an average soil ingestion rate, because average inputs are required by the ALM. Arsenic risks were evaluated using 0.330 g/day for the onsite and construction workers, 0.100 g/day for the groundskeeper, and 0.050 g/day for all other receptors. The arsenic risks use a high-end ingestion rate that represents the "reasonable maximum exposure" or RME. However, a survey of recent literature suggests that the average soil ingestion rate value for adults is closer to 0.02 g/day (Bowers *et al.*, 1994). Therefore, the soil ingestion rates used here are conservative in that they will tend to overestimate risk.

Lead Absorption Fraction. A lead absorption fraction used in the ALM was USEPA's default value of 0.12. This value is based on 20% absorption of lead from water, and 60% relative bioavailability of lead from soil (0.20 x 0.60 = 0.12). The 20% absorption of lead from water is an upper-end value based on consumption on an empty stomach. This is a conservative assumption that may overestimate risk. O'Flaherty (1993) suggests that a value of 8% may be a more appropriate absorption value for food and water in adults. This value assumes that people consume food at average mealtimes throughout the day, therefore the lead absorption rate is slower due to the presence of food in the stomach. If we use an adult soil ingestion rate of 0.02 g/day, combined with a lead absorption fraction of 8% (or for soil, 0.08 x 0.6 = 0.048), we find that the lead risks calculated for adult receptors could be on the order of 60-70% lower than those presented here. Thus the adult lead risks presented in this report are likely conservative overestimates.

Fraction from site. Each receptor's daily soil exposure was assumed to be solely from impacted soil within the exposure area. This is a conservative assumption, since it is expected that workers would be at the site for only 8 hours a day, and would be exposed to soil and dust from other sources during the remaining part of each day (*e.g.*, from home). For instance, in the grassy area, the exposure is likely overestimated for the future site worker, since we assumed he would obtain 100% of this daily soil ingestion during the hour or so that he visits the grassy area at lunchtime.

Exposure Duration. Gradient assumed an upper bound (95th percentile) exposure duration of 25 years for the future site worker, groundskeeper, and offsite gas facility worker (USEPA, 1991). This assumption is conservative and is likely to result in an overestimate of exposure and risk for most workers, since many workers do not remain at the same job for 25 years.

5.5.2 Uncertainties in Arsenic Risk Assessment

Risk management decisions for arsenic are confounded by the unusual nature of natural arsenic background risks, which for both food and water yield cancer risks of 10^{-4} or higher, and because of the substantial uncertainty associated with the arsenic cancer slope factor. This section describes some of the unique uncertainties associated with arsenic. In general, the assumptions we have used tend to overestimate arsenic risks.

5.5.2.1 Background Levels of Arsenic in Food, Water, Air, and Soil

Humans are exposed to low levels of arsenic in food, water, air, and soil (ATSDR, 2000). Food is typically the largest source of arsenic exposure, with dietary exposure accounting for about 70% of the daily intake of inorganic arsenic (Borum and Abernathy, 1994). The U.S. EPA estimates that the U.S.

population ingests approximately 18 μg of inorganic arsenic every day from food (USEPA 1988). This translates into a 4×10^{-4} cancer risk estimate based on continuous lifetime exposure, and EPA's current assessment of the carcinogenic potential of arsenic.

In the U.S., the average background level of arsenic in drinking water is approximately 2 μg/L (ATSDR, 2000). The recent U.S. EPA rule allows a permissible level or maximum contaminant level (MCL) of 10 μg/L arsenic in drinking water (USEPA, 2001a), a 5-fold lower value than the prior MCL of 50 μg/L. The rule allows community and non-transient, non-community water systems 5 years to attain compliance with the new MCL. Assuming the average background level and an ingestion rate of 2 L drinking water per day, an adult would ingest 4 μg inorganic arsenic per day. At the new MCL of 10 μg/L, an adult would ingest 20 μg inorganic arsenic per day, while at the old MCL of 50 μg/L, an adult would ingest 100 μg inorganic arsenic per day. These values translate into a range of cancer risk estimates between 9×10^{-5} and 2×10^{-3} based on continuous lifetime exposure, and EPA's current assessment of the carcinogenic potential of arsenic. EPA currently estimates that approximately 11 million people in the U.S. are served by community water systems with arsenic levels above the revised MCL. These people therefore have a cancer risk from water alone above 4×10^{-4}.

The mean levels of arsenic in ambient air range from less than 1 to 3 ng/m^3 in rural areas and from 20 to 30 ng/m^3 in urban areas (ATSDR, 2000). Assuming an inhalation rate of 20 m^3/day, an adult would breathe in less than 0.02 to 0.06 μg inorganic arsenic per day in rural areas, and 0.4 to 0.6 μg in urban areas. Arsenic levels could be higher in urban areas due to emissions from coal-fired power plants. However, the maximum concentrations measured in a 24-hour period are generally below 100 ng/m^3 (ATSDR, 2000). These background values translate into a range of cancer risk estimates between 4×10^{-7} and 1×10^{-5}.

Background arsenic levels in soil in Indiana range from 3.6 to 15 mg/kg, with an average concentration of 7.5 mg/kg (Dragun and Chiasson, 1991).

Total cancer risk from a combination of background exposures to arsenic in food, water, air, and soil may be as high as between 10^{-4} and 10^{-3} for a substantial portion of the U.S. population.

5.5.2.2 Body Burdens of Arsenic

Soil arsenic has a modest impact on body burden, as evidenced by urinary arsenic levels. Although elevated urinary arsenic levels were reported to be associated with very high soil arsenic levels near copper smelters (Baker *et al.*, 1977; Binder *et al.*, 1987), several studies consistently demonstrated that very low urinary arsenic levels were produced from soil arsenic concentrations below 200 mg/kg. In addition, the Anaconda, MT study demonstrated that urinary arsenic levels were unaffected by soil arsenic levels as high as 500 mg/kg. This observation occurs in part because of the small impact of soil arsenic relative to the impact of background levels of arsenic in food and water.

5.5.2.3 Bioavailability of Arsenic in Soil

Another explanation for the minor impact of soil arsenic on body burdens of arsenic is that arsenic in soil has a relatively low bioavailability and is absorbed into the body (*i.e.*, bloodstream) less efficiently than arsenic in water, the form used by U.S. EPA for the arsenic cancer slope factor. The bioavailability of arsenic in soil depends on two steps: solubilization in gastrointestinal (GI) fluids and absorption across the GI epithelium into the bloodstream (Valberg *et al.*, 1997). Both the solubilization and absorption depend on a variety of factors including the chemical forms of arsenic, the mode of intake by the individual (with or without food, type of food), and the nutritional status, which affects the pH throughout the GI tract, and GI transit time.

The solubility of arsenic depends on soil particle size and the associated soil matrix materials. Particle size affects solubility because larger particles dissolve more slowly than smaller particles, hence, the percentage dissolved during GI transit time increases as particle size decreases. Solubility of arsenic may be limited when insoluble matrix minerals (*e.g.*, quartz) encase arsenic compounds. Similarly, formation of iron-arsenic oxides and phosphates, and prevalence of authigenic carbonate and silicate complexes also limit the solubility of arsenic (Davis *et al.*, 1992, 1996). The solubility in the GI tract is complex since the pH conditions change from low pH in the stomach to a much higher pH in the small intestine. Readily soluble arsenic compounds, such as arsenate and arsenite, are more bioavailable than poorly soluble arsenic compounds, such as arsenic trioxide (ATSDR, 2000).

Several animal studies have evaluated the bioavailability of soil-bound arsenic. Results from Freeman *et al.* (1993 and 1995) and Groen *et al.* (1994) indicated that soil-bound arsenic is not as bioavailable as arsenic in solution. The bioavailability of soil arsenic relative to aqueous arsenic administered by gavage was approximately 20 percent in monkeys and 48 percent in rabbits. The higher relative bioavailability in rabbits reflected the higher absolute bioavailability in this species. This was much lower than the 64 to 69 percent of arsenic recovered in urine after ingestion of dissolved arsenic by human volunteers (Johnson and Farmer, 1991). Casteel *et al.* (1997) conducted a multi-year investigation of bioavailability of metals in soil and mine wastes using young swine whose GI system is more similar to humans than other animals. The relative bioavailability of arsenic in soils at various mining and smelting sites ranged from 7 to 52%, which agreed with the results of previous studies by Freeman *et al.* and Groen *et al.* Rodriguez *et al.* (1999) performed a similar swine study that reported the range of 2.7 to 42.8% relative bioavailability of arsenic in soil. Based on Gradient's literature review, a relative bioavailability of 50% is the maximum value reported in any of the peer-reviewed, published arsenic bioavailability studies. This evaluation used a relative bioavailability of 80%, based on guidance from USEPA Region 10. The relative bioavailability of 80% is thus likely to overestimate arsenic risks.

5.5.2.4 Cancer Slope Factor (CSF) for Arsenic

Reports on arsenic toxicity in humans are largely based on exposure to arsenic compounds in media other than soil, for example, consumption of drinking water and inhalation in occupational settings. USEPA has derived toxicity factors, *i.e.*, reference dose (RfD) and cancer slope factor (CSF), for ingested arsenic based on data from a Taiwanese study evaluating the health effects associated with the consumption of water containing high concentrations of arsenic (Chen *et al.*, 1985; Tseng *et al.*, 1968). Although the application of the population data used to derive the RfD and CSF has been heavily debated (Carlson-Lynch *et al.*, 1994; Smith *et al.*, 1995; Beck *et al.*, 1995; Mushak and Crocetti, 1995, 1996; Slayton *et al.*, 1996), the values derived are generally believed to be conservative.

The CSF is based on skin cancer observed in a study of over 40,000 people in Taiwan who were exposed for a significant portion of their lifetime to elevated levels of arsenic in groundwater. Although the study clearly indicates an association between high levels of arsenic exposure and cancer, the study design limits its usefulness to derive precise dose-response relationships. The reasons are summarized below:

> **Exposure Assessment.** There are considerable scientific concerns about the exposure estimates in the Taiwanese study (USEPA Region 6, 1998). Individual exposures were not characterized, and exposures were based on average arsenic concentrations of ground water in wells in each village. The amount of exposure was broadly classified into three groups (high, medium and low) and the original data were not available. The analytical method used to measure arsenic concentrations may not be accurate at low levels.

Human-to-Human Variation. In general, dose levels, genetic factors, dietary patterns, or other life style factors may alter arsenic metabolism and detoxification in different populations (USEPA Region 6, 1998). Taiwanese may be more susceptible than U.S. population, and therefore CSF based on Taiwanese population may overestimate cancer for U.S. population. The protein deficiencies in Taiwanese diets could affect their ability to methylate and therefore detoxify arsenic, leading to an increase in cancer risk. Consequently, extrapolation from one population to another becomes highly uncertain.

Other Sources of Exposure. When the U.S. EPA derived the CSF, they did not take into account other possible sources of arsenic in the Taiwanese diet (*e.g.*, from rice and yams) and dietary uses of drinking water. Hence, the assumptions used by the U.S. EPA in deriving toxicity values for arsenic underestimate the total arsenic intake, and as a result, the CSF may overestimate cancer risks.

Non-Linear Dose-Response. A recent U.S. EPA panel concluded that the dose-response for arsenic appeared to be non-linear (USEPA, 1997b), and the U.S. EPA Region 6 concluded that the available data "support a plausible threshold" (USEPA Region 6, 1998). The possible sub-linear or threshold dose-response relationship suggests that cancer risk at low doses of arsenic may be less than predicted based on a linear model.

Arsenic Differs in Water and Soil. Health effects associated with arsenic in water may not be relevant to assess the toxicity in soil (Valberg *et al.*, 1997). Arsenic exists in different chemical forms in water and soil, which may lead to potential differences in systemic bioavailability and dose-to-target organ. The relative proportion of overall arsenic intake and the correlation with urinary-arsenic concentrations may also be different between arsenic in water and soil. The differences will ultimately impact the overall potential for adverse health effects..

Overall, these uncertainties limit precise quantification of the dose-response relationship, but suggest the current CSF may overestimate cancer risks for a U.S. population exposed to lower levels of arsenic. Two recently published articles provide evidence that the CSF overestimates the cancer risk for arsenic as applied to drinking water studies outside the U.S. (Guo and Valberg, 1997) and within the U.S. (Valberg *et al.*, 1998). These papers report a meta-analysis of epidemiological studies evaluating the skin cancer incidence of 29 populations in India, Japan, Mexico, Taiwan and the U.S. who were exposed to 1.17 to 270 μg/L arsenic in water. The authors evaluated the validity of U.S. EPA arsenic CSF model to predict the expected number of skin cancers by conducting a likelihood ratio analysis. This analysis showed that a null hypothesis of no additional skin cancer risk from arsenic was approximately two times more likely than the hypothesis of the predicted rate of skin cancer from arsenic. This analysis indicated that the CSF derived from arsenic exposure in the Taiwanese populations is likely to be an overestimate when applied to the U.S. populations.

Additionally, in the epidemiological studies of a U.S. population that has been exposed to arsenic in drinking water, no increased cancer rate has been observed (USEPA Region 6, 1998). This is further supported by studies of individuals exposed to arsenic in soil who thus far have not indicated any toxicity (Binder *et al.*, 1987; Wong *et al.*, 1992).

5.5.2.5 Summary of Arsenic Risks and Uncertainty

Any effect of arsenic in soil on total arsenic body burden is difficult to observe as a result of the commonly reduced bioavailability of arsenic in soil, and the extent to which soil's contribution to body burden is overwhelmed by background levels of arsenic in food and water. Coupling these considerations with the uncertainty in the derivation of the arsenic cancer slope factor suggest that an acceptable risk level for soil arsenic may be close to 10^{-4}.

5.5.3 Uncertainties in Risk Characterization

Uncertainties associated with the first three steps of the risk assessment (data collection, exposure assessment, and toxicity assessment) are incorporated into the risk estimates in the risk characterization step. Although there are numerous uncertainties associated with this risk assessment, the incorporation of a large number of conservative assumptions has yielded risk estimates that are likely to overestimate actual site risks.

6 Soil Lead Cleanup Levels and Residual Risk

6.1 Soil Cleanup Levels

Lead risks are unacceptable for both construction workers in the main facility area, and the groundskeeper, the future site worker, both construction workers, and the trespasser exposed to sediment in the grassy area. Therefore, soil lead cleanup levels were calculated for these scenarios.

A preliminary remediation goal (PRG) is the average concentration in an exposure area that will result in an acceptable risk to a particular receptor. PRGs are risk-based target cleanup levels that must be met *on average* throughout the exposure area. It is acceptable to leave concentrations that exceed the cleanup level, so long as the post-remediation *average* concentration does not exceed the risk-based cleanup level.

The Remedial Action Level (RAL) is the concentration above which soil must be removed, so that the post-remediation *average* concentration meets the specified target cleanup level (USEPA, 2001b). The RAL is a remedial action goal (*i.e.,* a remediation trigger concentration) that ensures the post-remediation average concentration at a site achieves the target cleanup level with a specified level of confidence. It is important to note that the PRGs are specific to the receptor and exposure area for which they are developed, and the RALs are calculated with the specific dataset used to derive the EPC for that receptor. Therefore, it would not be appropriate to apply the lowest of all the PRGs or RALs to all of the exposure areas evaluated at the site. If the site was required to have only one PRG applicable to all areas, then all of the site data would need to be combined and assessed as one exposure unit.

According to U.S. EPA guidance, a risk-based cleanup is achieved when the post-remediation average concentration meets the risk-based cleanup level. The goal is to calculate a RAL so that the post-remediation average concentration will achieve the risk-based target cleanup level (the PRG) with a specified level of confidence. Gradient used a Confidence Removal Goal (CRG) algorithm (Bowers *et al.*, 1996)[2] to determine the RAL. The algorithm has been coded into a computer program which runs in Visual Basic. The CRG algorithm accounts for the inherent uncertainty in characterizing the soil concentration and calculates the RAL so that there is a 95% certainty that the average of the post-remediation data (plus the clean replacement fill) will be less than or equal to the PRG. This method is described in USEPA, 2001b.

[2] Bowers, TS; Shifrin, NS; Murphy, BL. 1996. "Statistical approach to meeting soil cleanup goals." *Environ. Sci. Technol.* 30 (5) :1437-1444.

PRGs for lead are presented in Table 7 for the receptors with unacceptable lead risks. RALs were calculated for these receptors, assuming that excavated soil would be replaced with clean backfill containing lead at 50 mg/kg. In the main facility area, the RAL is 78,900 mg/kg for Construction Worker 1; this scenario assumes that Exide retains the property, and that several small construction projects are conducted over a 5 year period. In the main facility area, the RAL is 8,470 mg/kg for Construction Worker 2; this scenario assumes that the facility is sold and undergoes a one year redevelopment project involving subsurface excavation. In the grassy area, the RALs for surface soil (0 to 6 inches) are 73,900 mg/kg for the Groundskeeper, and 16,655 mg/kg for the Worker. In the grassy area, the RALs for subsurface soil and sediment combined (0 to 30 inches) are 43,300 mg/kg for Construction Worker 1, and 4954 mg/kg for Construction Worker 2. In the grassy area, the RAL for sediment alone is 34,000 mg/kg for the Trespasser. Appendix B shows the sample locations that would be subject to remediation for the scenario with the lowest RAL in each exposure area. The governing lead RAL for each exposure area is presented in Table 8. Appendix B shows that after removal of these samples, and replacement with clean fill, the average of the post-remedial data points is less than the PRG.

Table 8
Governing Lead RAL for Each Exposure Area

Exposure Area	Media	Receptor	Lead RAL (mg/kg)
Onsite Main Facility Area	Soil (0-5 ft)	Construction Worker 1 (Property retained by Exide)	78,900
Onsite Main Facility Area	Soil (0-5 ft)	Construction Worker 2 (Property sold)	8,470
Grassy Area	Soil and Sediment (0-6")	Future Site Worker	16,665
Grassy Area	Soil and Sediment (0-30")	Construction Worker 1 (Property retained by Exide)	43,300
Grassy Area	Soil and Sediment (0-30")	Construction Worker 2 (Property sold)	4,954
Grassy Area	Sediment (0-6")	Adolescent Trespasser	34,000

6.2 Post-Remediation Residual Risk

Lead and arsenic concentrations are generally correlated, therefore, rather than calculate PRGs and RALs for arsenic, we considered the effects of lead remediation on the arsenic risks. The residual risk from arsenic was calculated assuming that soil was remediated for lead in the main facility area and the grassy area. Residual arsenic risks were calculated for the receptors that had a cancer risk greater than 1×10^{-5}, or a hazard index greater than 1.0 (Table 9). The post-remediation arsenic data sets are presented in Appendix D. We used the lead RALs that corresponded to the receptors listed in Table 9. The post-remediation arsenic EPCs were calculated (using ProUCL) assuming that excavated soil was replaced with clean backfill containing arsenic at 5 mg/kg (Table 9 and Appendix D). Residual cancer risks range from 1×10^{-6} to 7×10^{-6}, and residual noncancer risks range from 0.03 to 0.2 (Table 9). On the basis of this analysis, PRGs and RALs for arsenic are not needed and were therefore not calculated.

Table 9
Summary of Post-Remediation Risks for Arsenic

	Pre-Remediation			Post-Remediation		
Receptor/Exposure Pathway	Arsenic EPC (mg/kg)	Cancer Risk	Hazard Index	Arsenic EPC (mg/kg)	Cancer Risk	Hazard Index
Onsite Construction Worker 2	123	7E-06	1	15.9	9E-07	0.1
Grassy Area Groundskeeper	779	7E-05	0.4	49.2	4E-06	0.03
Grassy Area Site Worker	779	1E-04	0.7	49.2	7E-06	0.04
Grassy Area Construction Worker 1	818	5E-05	2	24.0	1E-06	0.04
Grassy Area Construction Worker 2	818	5E-05	8	24.0	1E-06	0.2

7 Conclusions

Cancer risks attributable to arsenic were calculated for receptors in five exposure areas. All of the calculated cancer risks fall within or below USEPA's target risk range of 1×10^{-6} to 1×10^{-4}. Cancer risks ranged from 3×10^{-7} to 1×10^{-4}. The exposure scenario with the highest excess lifetime cancer risk is the future site worker in the grassy area (1×10^{-4}). The exposure pathway with the greatest contribution to cancer risk is soil ingestion.

Noncancer risks attributable to arsenic were calculated for receptors in five exposure areas. Noncancer risks exceeded USEPA's target hazard index of 1.0 for the onsite Construction Worker 2; and Construction Workers 1 and 2 in the grassy area. The exposure scenario with the highest noncancer risk is the grassy area Construction Worker 2 (HI of 7.6). The exposure pathway with the greatest contribution to noncancer risk is soil ingestion.

Lead risks were evaluated for adult and/or adolescent receptors in five exposure areas. Lead risks were evaluated by comparing the predicted fetal BLL for each receptor to USEPA's BLL goal of 10 µg/dL. Predicted 95th percentile fetal BLLs exceeded USEPA goals for the following receptors: Construction Workers 1 and 2 in the main facility area, the groundskeeper and future site worker exposed to surface soil in the grassy area, Construction Workers 1 and 2 exposed to subsurface soil in the grassy area, and the Trespasser exposed to sediment in the grassy area. The predicted 95th percentile fetal BLL did not exceed the USEPA goal for the following receptors: the Utility Worker in the main facility area, the Trespasser exposed to soil in the grassy area, the Recreator in the Railroad Ditch, the Recreator along Arlington Ave, and the Offsite Gas Facility Worker.

PRGs and RALs were calculated for lead, for the receptors with unacceptable lead risks. In the main facility area onsite, the RAL is 78,900 mg/kg for Construction Worker 1, and 8,470 mg/kg for Construction Worker 2. For grassy area surface soil, the RAL is 73,900 mg/kg for the Groundskeeper, and 16,655 mg/kg for the Site Worker. For grassy area subsurface soil and sediment combined, the RAL is 43,300 mg/kg for Construction Worker 1, and 4954 mg/kg for Construction Worker 2. For the grassy area sediment alone, the RAL is 34,000 mg/kg for the Trespasser.

The residual risk from arsenic was calculated assuming that soil was remediated for lead in the main facility area and the grassy area. Residual cancer risks range from 9×10^{-7} to 7×10^{-6}. Residual noncancer risks range from 0.03 to 0.2. All post-remediation residual risks for arsenic are within or below EPA's target risk range for cancer and non-cancer risks.

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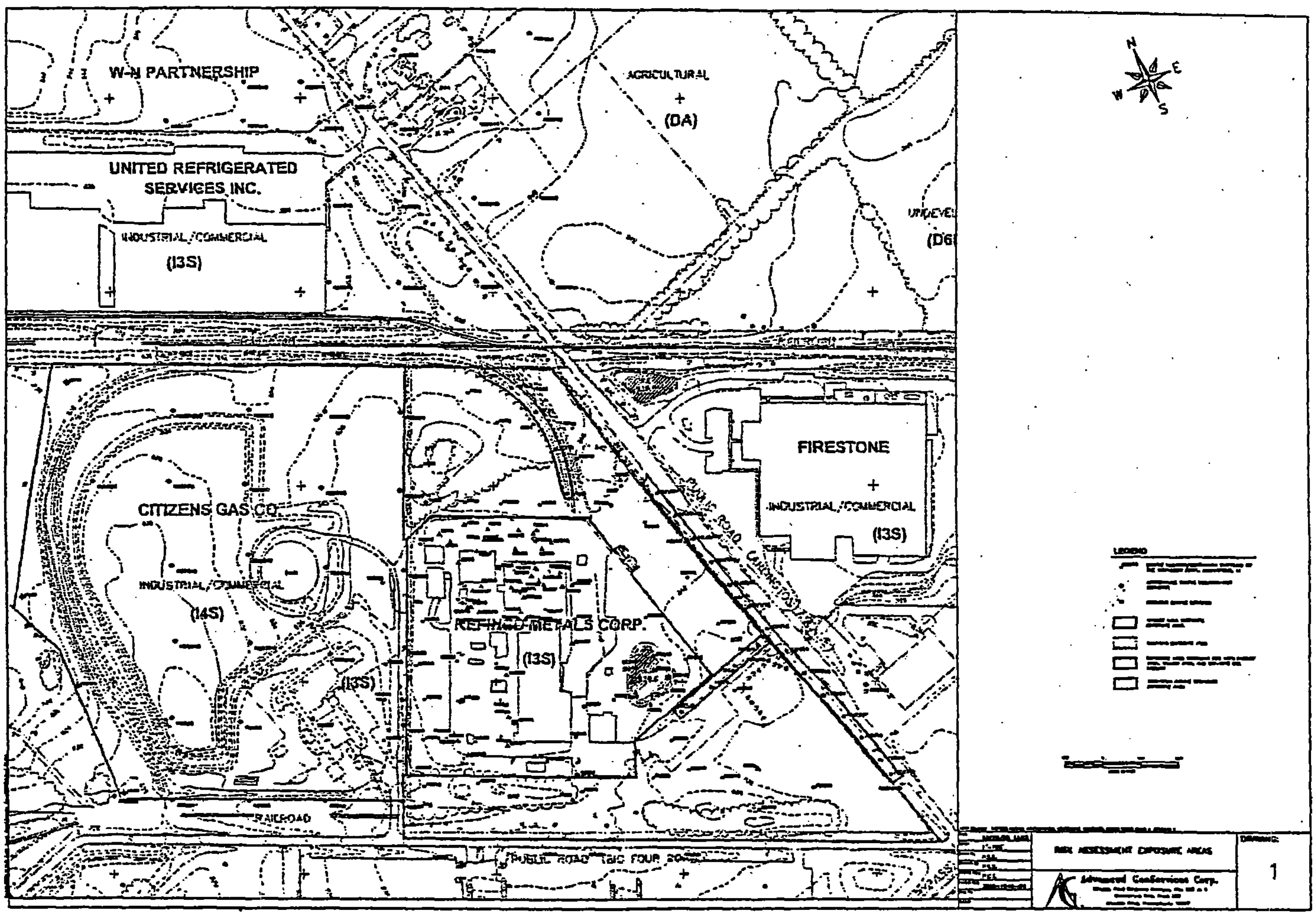

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(I3S)
FIRESTONE
INDUSTRIAL/COMMERCIAL
(I3S)
CITIZENS GAS CO.
INDUSTRIAL/COMMERCIAL
(I4S)
(I3S)
REFINED METALS CORP.
(I3S)
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RISK ASSESSMENT EXPOSURE AREAS
Advanced GeoServices Corp.
DRAWING:
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Appendix A

Risk Calculation Tables

Appendix A
Arsenic Risk Summary

Receptor/Exposure Pathway		Cancer Risk	Hazard Index	Percent Contribution
Onsite Construction Worker 1				
Dermal Contact with Soil		5.1E-07	0.02	7%
Ingestion of Soil		6.8E-06	0.2	93%
	Total:	**7E-06**	**0.2**	
Onsite Construction Worker 2				
Dermal Contact with Soil		5.1E-07	0.1	7%
Ingestion of Soil		6.8E-06	1.1	93%
	Total:	**7E-06**	**1**	
Onsite Utility Worker				
Dermal Contact with Soil		2.0E-07	0.003	7%
Ingestion of Soil		2.7E-06	0.04	93%
	Total:	**3E-06**	**0.05**	
Grassy Area Groundskeeper				
Dermal Contact with Soil and Sediment		5.7E-06	0.04	8%
Ingestion of Soil and Sediment		6.5E-05	0.4	92%
	Total:	**7E-05**	**0.44**	
Grassy Area Site Worker				
Dermal Contact with Soil and Sediment		1.6E-05	0.1	15%
Ingestion of Soil and Sediment		9.4E-05	0.6	85%
	Total:	**1E-04**	**0.7**	
Grassy Area Construction Worker 1				
Dermal Contact with Soil and Sediment		3.4E-06	0.1	7%
Ingestion of Soil and Sediment		4.5E-05	1.4	93%
	Total:	**5E-05**	**2**	
Grassy Construction Worker 2				
Dermal Contact with Soil and Sediment		3.4E-06	0.5	7%
Ingestion of Soil and Sediment		4.5E-05	7.0	93%
	Total:	**5E-05**	**8**	
Grassy Area Trespasser Adolescent 1				
Dermal Contact with Soil		5.7E-08	0.002	18%
Ingestion of Soil		2.6E-07	0.008	82%
	Total:	**3E-07**	**0.01**	
Grassy Area Trespasser Adolescent 2				
Dermal Contact with Sediment		1.3E-06	0.04	18%
Ingestion of Sediment		5.9E-06	0.18	82%
	Total:	**7E-06**	**0.2**	

Appendix A
Arsenic Risk Summary

Receptor/Exposure Pathway		Cancer Risk	Hazard Index	Percent Contribution
Arlington Ave Adolescent Recreator				
Dermal Contact with Sediment		7.2E-08	0.002	18%
Ingestion of Sediment		3.2E-07	0.010	82%
	Total:	**4E-07**	**0.01**	
Railroad Ditch Adolescent Recreator				
Dermal Contact with Sediment		3.2E-07	0.01	18%
Ingestion of Sediment		1.4E-06	0.04	82%
	Total:	**2E-06**	**0.05**	
Offsite Gas Facility Worker				
Dermal Contact with Soil		2.7E-06	0.02	33%
Ingestion of Soil		5.4E-06	0.03	67%
	Total:	**8E-06**	**0.05**	

Appendix A
Excess Lifetime Cancer Risk by Chemical And Pathway for All Receptors

Ingestion of Soil and/or Sediment containing Arsenic

Exposure Areas and Receptors	Matrix	Arsenic Concentration (C) mg/kg	Intake Factor (IF)	Bioavailability (R)	Daily Intake DI = CxIFxR (mg/kg-day)	Slope Factor (SF) (kg-day/mg)	Total Cancer Risk CR = DIxSF
Onsite Construction Worker 1	Soil	123	4.6E-08	0.8	5.7E-06	1.5	6.8E-06
Onsite Construction Worker 2	Soil	123	4.6E-08	0.8	5.7E-06	1.5	6.8E-06
Onsite Utility Worker	Soil	123	1.8E-08	0.8	2.3E-06	1.5	2.7E-06
Grassy Area Groundskeeper	Soil and Sediment	779	7.0E-08	0.8	5.4E-05	1.5	6.5E-05
Grassy Area Future Industrial Site Worker	Soil and Sediment	779	1.0E-07	0.8	7.8E-05	1.5	9.4E-05
Grassy Area Construction Worker 1	Soil and Sediment	818	4.6E-08	0.8	3.8E-05	1.5	4.5E-05
Grassy Area Construction Worker 2	Soil and Sediment	818	4.6E-08	0.8	3.8E-05	1.5	4.5E-05
Grassy Area Adolescent Trespasser	Soil	60	3.5E-09	0.8	2.1E-07	1.5	2.6E-07
Grassy Area Adolescent Trespasser	Sediment	1387	3.5E-09	0.8	4.9E-06	1.5	5.9E-06
Arlington Ave Adolescent Recreator	Sediment	38	7.1E-09	0.8	2.7E-07	1.5	3.2E-07
Railroad Ditches Adolescent Recreator	Sediment	169	7.1E-09	0.8	1.2E-06	1.5	1.4E-06
Offsite Gas Facility Worker	Soil	29	1.6E-07	0.8	4.5E-06	1.5	5.4E-06

Notes:

IF = Intake Factor (IR * FS * ED * ED * CF) / (BW * AT) =
AT = Averaging Time - Cancer (d) = 25550
BW = Body Weight (kg)
CF = Conversion Factor (kg/mg)
ED = Exposure Duration (yrs)
EF = Exposure Frequency (d/yr)
FS = Fraction from Contaminated Source
IR = Ingestion Rate (mg/d)

Appendix A
Excess Lifetime Cancer Risk by Chemical And Pathway for All Receptors

Dermal Contact with Soil and/or Sediment containing Arsenic

Exposure Areas and Receptors	Matrix	Arsenic Concentration (C) mg/kg	Intake Factor (IF)	Dermal Absorption (A)	Daily Intake DI = CxIFxA (mg/kg-day)	Slope Factor (SF) (kg-day/mg)	Total Cancer Risk CR = DIxSF
Onsite Construction Worker 1	Soil	123	9.2E-08	3.0E-02	3.4E-07	1.5	5.1E-07
Onsite Construction Worker 2	Soil	123	9.2E-08	3.0E-02	3.4E-07	1.5	5.1E-07
Onsite Utility Worker	Soil	123	3.7E-08	3.0E-02	1.4E-07	1.5	2.0E-07
Grassy Area Groundskeeper	Soil and Sediment	779	1.6E-07	3.0E-02	3.8E-06	1.5	5.7E-06
Grassy Area Future Industrial Site Worker	Soil and Sediment	779	4.6E-07	3.0E-02	1.1E-05	1.5	1.6E-05
Grassy Area Construction Worker 1	Soil and Sediment	818	9.2E-08	3.0E-02	2.3E-06	1.5	3.4E-06
Grassy Area Construction Worker 2	Soil and Sediment	818	9.2E-08	3.0E-02	2.3E-06	1.5	3.4E-06
Grassy Area Adolescent Trespasser	Soil	60	2.1E-08	3.0E-02	3.8E-08	1.5	5.7E-08
Grassy Area Adolescent Trespasser	Sediment	1387	2.1E-08	3.0E-02	8.8E-07	1.5	1.3E-06
Arlington Ave Adolescent Recreator	Sediment	38	4.2E-08	3.0E-02	4.8E-08	1.5	7.2E-08
Railroad Ditches Adolescent Recreator	Sediment	169	4.2E-08	3.0E-02	2.1E-07	1.5	3.2E-07
Offsite Gas Facility Worker	Soil	29	2.1E-06	3.0E-02	1.8E-06	1.5	2.7E-06

Notes:

IF = Intake Factor (AF * SA * ED * ED * CF) / (BW * AT) =
AT = Averaging Time - Cancer (d) = 25550
BW = Body Weight (kg)
CF = Conversion Factor (kg/mg)
ED = Exposure Duration (yrs)
EF = Exposure Frequency (d/yr)
SA = Surface Area Exposed to Soil and/or Sediment (cm^2/event)
AF = Soil and/or Sediment/Skin Adherence Factor (mg/cm^2)

Appendix A
Noncancer Hazard Quotient by Chemical And Pathway for All Receptors

Ingestion of Soil and/or Sediment containing Arsenic

Exposure Areas and Receptors	Matrix	Arsenic Concentration (C) mg/kg	Intake Factor (IF)	Bioavailability (R)	Daily Intake DI = CxIFxR (mg/kg-day)	Reference Dose (RfD) (mg/kg-day)	Hazard Quotient HQ=DI÷RfD
Onsite Construction Worker 1	Soil	123	6.5E-07	0.8	6.5E-07	3.00E-04	2.1E-01
Onsite Construction Worker 2	Soil	123	3.2E-06	0.8	3.2E-06	3.00E-04	1.1E+00
Onsite Utility Worker	Soil	123	1.3E-07	0.8	1.3E-07	3.00E-04	4.2E-02
Grassy Area Groundskeeper	Soil and Sediment	779	2.0E-07	0.8	2.0E-07	3.00E-04	4.1E-01
Grassy Area Future Industrial Site Worker	Soil and Sediment	779	2.8E-07	0.8	2.8E-07	3.00E-04	5.9E-01
Grassy Area Construction Worker 1	Soil and Sediment	818	6.5E-07	0.8	6.5E-07	3.00E-04	1.4E+00
Grassy Area Construction Worker 2	Soil and Sediment	818	3.2E-06	0.8	3.2E-06	3.00E-04	7.0E+00
Grassy Area Adolescent Trespasser	Soil	60	5.0E-08	0.8	5.0E-08	3.00E-04	7.9E-03
Grassy Area Adolescent Trespasser	Sediment	1387	5.0E-08	0.8	5.0E-08	3.00E-04	1.8E-01
Arlington Ave Adolescent Recreator	Sediment	38	9.9E-08	0.8	9.9E-08	3.00E-04	1.0E-02
Railroad Ditches Adolescent Recreator	Sediment	169	9.9E-08	0.8	9.9E-08	3.00E-04	4.5E-02
Offsite Gas Facility Worker	Soil	29	4.4E-07	0.8	4.4E-07	3.00E-04	3.3E-02

Notes:

IF = Intake Factor (IR * FS * ED * ED * CF) / (BW * AT) =
AT = Averaging Time - Noncancer (d) = ED * EF
BW = Body Weight (kg)
CF = Conversion Factor (kg/mg)
ED = Exposure Duration (yrs)
EF = Exposure Frequency (d/yr)
FS = Fraction from Contaminated Source
IR = Ingestion Rate (mg/d)

Appendix A
Noncancer Hazard Quotient by Chemical And Pathway for All Receptors

Dermal Contact with Soil and/or Sediment containing Arsenic

Exposure Areas and Receptors	Matrix	Arsenic Concentration (C) mg/kg	Intake Factor (IF)	Dermal Absorption (A)	Daily Intake DI = CxIFxA (mg/kg-day)	Reference Dose (RfD) (mg/kg-day)	Hazard Quotient HQ=DI÷RfD
Onsite Construction Worker 1	Soil	123	1.3E-06	3.0E-02	4.8E-06	3.0E-04	1.6E-02
Onsite Construction Worker 2	Soil	123	6.5E-06	3.0E-02	2.4E-05	3.0E-04	7.9E-02
Onsite Utility Worker	Soil	123	2.6E-07	3.0E-02	9.5E-07	3.0E-04	3.2E-03
Grassy Area Groundskeeper	Soil and Sediment	779	4.5E-07	3.0E-02	1.1E-05	3.0E-04	3.5E-02
Grassy Area Future Industrial Site Worker	Soil and Sediment	779	1.3E-06	3.0E-02	3.0E-05	3.0E-04	1.0E-01
Grassy Area Construction Worker 1	Soil and Sediment	818	1.3E-06	3.0E-02	3.2E-05	3.0E-04	1.1E-01
Grassy Area Construction Worker 2	Soil and Sediment	818	6.5E-06	3.0E-02	1.6E-04	3.0E-04	5.3E-01
Grassy Area Adolescent Trespasser	Soil	60	3.0E-07	3.0E-02	5.3E-07	3.0E-04	1.8E-03
Grassy Area Adolescent Trespasser	Sediment	1387	3.0E-07	3.0E-02	1.2E-05	3.0E-04	4.1E-02
Arlington Ave Adolescent Recreator	Sediment	38	5.9E-07	3.0E-02	6.8E-07	3.0E-04	2.3E-03
Railroad Ditches Adolescent Recreator	Sediment	169	5.9E-07	3.0E-02	3.0E-06	3.0E-04	1.0E-02
Offsite Gas Facility Worker	Soil	29	5.8E-06	3.0E-02	5.0E-06	3.0E-04	1.7E-02

Notes:

IF = Intake Factor (AF * SA * ED * ED * CF) / (BW * AT) =
AT = Averaging Time - Noncancer (d) = ED * EF
BW = Body Weight (kg)
CF = Conversion Factor (kg/mg)
ED = Exposure Duration (yrs)
EF = Exposure Frequency (d/yr)
SA = Surface Area Exposed to Soil and/or Sediment (cm^2/event)
AF = Soil and/or Sediment/Skin Adherence Factor (mg/cm^2)

Appendix B
Data Sets Used for Lead EPCs
and
Lead Cleanup Calculations

Railroad Ditch
Lead Data in Sediment

MATRIX	Station	SAMPLE ID	DEPTH	Lead (mg/kg)
SED	R2SB30	R2SB30-0-3	0-3"	1810
SED	R2SB29	R2SB29-0-3	0-3"	14800
SED	R2SB28	R2SB28-0-3	0-3"	684
SED	R2SB27	R2SB27-0-3	0-3"	786
SED	R2SB26	R2SB26-0-3	0-3"	12200
SED	R2SB25	R2SB25-0-3	0-3"	617
			Average	5150

Onsite Lead Data
Averaged by Location

Average of All:	20266

Exposure Area	Station	Year	Number of Samples	Average (mg/kg)
Site	CSB1	1999	3	135837
Site	CSB1	2001	6	41830
Site	CSB-10	1999	4	92512
Site	CSB-10	2001	6	170374
Site	CSB11	1999	3	151841
Site	CSB12	1999	3	279784
Site	CSB13	1999	3	134
Site	CSB13	2001	5	702
Site	CSB14	1999	3	19
Site	CSB15	1999	3	42
Site	CSB16	1999	3	213
Site	CSB17	1999	3	69
Site	CSB18	1999	3	45
Site	CSB19	1999	3	132
Site	CSB2	1999	3	137800
Site	CSB20	1999	3	24
Site	CSB21	1999	3	131
Site	CSB22	1999	3	9
Site	CSB23	1999	3	18
Site	CSB24	1999	3	20
Site	CSB25	1999	3	980
Site	CSB26	1999	3	282
Site	CSB-26	2001	5	70
Site	CSB27	1999	3	16
Site	CSB28	1999	3	21
Site	CSB28	2001	5	20
Site	CSB29	1999	3	37
Site	CSB3	1999	5	88646
Site	CSB30	1999	3	15
Site	CSB30	2001	5	603
Site	CSB31	1999	3	907
Site	CSB32	1999	3	14632
Site	CSB32	2001	5	63632
Site	CSB33	1999	3	436
Site	CSB34	1999	3	32309
Site	CSB35	1999	6	3955
Site	CSB35	2001	6	70255
Site	CSB36	1999	3	82
Site	CSB37	1999	3	294
Site	CSB38	1999	3	19
Site	CSB38	2001	5	1313
Site	CSB39	1999	3	15628
Site	CSB4	1999	3	217355
Site	CSB40	1999	3	2231
Site	CSB41	1999	3	21
Site	CSB42	1999	3	12
Site	CSB49	1999	3	61
Site	CSB5	1999	3	78
Site	CSB50	1999	3	280
Site	CSB51	1999	6	17000
Site	CSB6	1999	3	95
Site	CSB7	1999	5	97267
Site	CSB8	1999	3	28356
Site	CSB9	1999	3	158

Onsite Lead Data
Averaged by Location

	Average of All:	20266

Exposure Area	Station	Year	Number of Samples	Average (mg/kg)
Site	RSB12	1999	2	14300
Site	RSB14	1999	2	8290
Site	RSB15	1999	2	641
Site	RSB17	1999	2	276
Site	RSB18	1999	2	288
Site	RSB19	1999	2	12
Site	RSB20	1999	2	345
Site	RSB22	1999	2	358
Site	RSB23	1999	2	572
Site	RSB25	1999	2	45715
Site	RSB26	1999	2	8900
Site	RSB27	1999	2	14
Site	RSB28	1999	2	1809
Site	RSB29	1999	2	915
Site	RSB31	1999	2	25550
Site	RSB32	1999	2	686
Site	RSB33	1999	2	1111
Site	RSB34	1999	2	19
Site	RSB37	1999	2	637
Site	RSB38	1999	2	1220
Site	RSB52	1999	3	56
Site	RSB53	1999	3	19
Site	RSB54	1999	3	13417
Site	RSB55	1999	3	22500
Site	RSB56	1999	3	48
Site	RSB57	1999	3	12750
Site	RSB58	1999	3	21367
Site	RSB71	1999	1	66800
Site	RSB72	1999	3	21
Site	RSB73	1999	3	2344
Site	RSB74	1999	3	211
Site	RSB75	1999	3	1894
Site	RSB76	1999	3	242
Site	RSB77	1999	3	4617
Site	RSB78	1999	3	2873
Site	RSB79	1999	3	142
Site	RSB80	1999	3	44
Site	RSB81	1999	3	86
Site	RSB82	1999	3	23
Site	RSB83	1999	3	20
Site	RSB84	1999	3	16
Site	RSB85	1999	3	9
Site	RSED6	1999	2	36000

Onsite Main Facility Area
Individual Sample Data

MATRIX	Station	SAMPLE ID	DEPTH	Arsenic	Lead
SOIL	CSB-10	CSB-10A-D	24-27"	2730	475000
SOIL	CSB12	CSB12A	0-3"	1050	467000
SOIL	CSB4	CSB4B	6-9"	164	460000
SOIL	CSB12	CSB12B	6-9"	2270	372000
SOIL	CSB11	CSB11B	6-9"	585	351000
SOIL	CSB35	CSB-35A-C	12-15"	406	350000
SOIL	CSB-10	CSB-10A-F	48-51"	1700	288000
SOIL	CSB1	CSB1B	6-9"	599	288000
SOIL	CSB-10	CSB-10A-C	12-15"	433	256000
SOIL	CSB7	CSB7A	0-3"	81	255000
SOIL	CSB1	CSB-1A-D	24-27"	989	249000
SOIL	CSB-10	CSB10B	6-9"	916	236000
SOIL	CSB4	CSB4A	0-3"	890	192000
SOIL	CSB2	CSB2C	12-15"	469	180000
SOIL	CSB2	CSB2A	0-3"	266	175000
SOIL	CSB32	CSB-32A-A	0-3"	394	164000
SOIL	CSB7	CSB7B	6-9"	786	154000
SOIL	CSB3	CSB3B	6-9"	565	150000
SOIL	CSB1	CSB1A	0-3"	406	139000
SOIL	CSB-10	CSB10A	0-3"	709	132000
SOIL	CSB3	CSB3A	0-3"	284	121000
SOIL	CSB11	CSB11A	0-3"	237	104000
SOIL	CSB34	CSB34A	0-3"	189	94500
SOIL	CSB3	CSB3D	24-28"	193	93900
SOIL	CSB32	CSB-32A-B	6-9"	199	90100
SOIL	CSB8	CSB8A	0-3"	66	83800
SOIL	RSB25	RSB25A	0-3"	867	83500
SOIL	CSB3	CSB3C	12-15"	217	78100
SOIL	CSB7	CSB7C	12-15"	343	77200
SOIL	CSB35	CSB-35A-A	0-3"	154	70400
SOIL	RSB71	RSB71A	0-3"	215	66800
SOIL	CSB32	CSB-32A-C	12-15"	230	64000
SOIL	CSB2	CSB2B	6-9"	159	58400
SED	RSED6	RSED6A	0-6"	305	57200
SOIL	CSB51	CSB51A	0-3"	285	47300
SOIL	CSB39	CSB39A	0-3"	863	46800
SOIL	CSB32	CSB32A	0-3"	388	42800
SOIL	RSB58	RSB58A	0-3"	247	32000
SOIL	RSB31	RSB31B	3-10"	232	27400
SOIL	RSB55	RSB55A	0-3"	323	27400
SOIL	RSB55	RSB55B	3-10"	359	27000
SOIL	RSB31	RSB31A	0-3"	202	23700
SOIL	RSB54	RSB54A	0-3"	107	22800
SOIL	RSB58	RSB58B	3-10"	200	21000
SOIL	CSB51	CSB51D	24-28"	36	18700
SOIL	RSB12	RSB12B	3-10"	125	17500
SOIL	RSB57	RSB57B	3-10"	127	17400
SOIL	RSB54	RSB54B	3-10"	94	17300

Construction Worker 1	
PRG	4600
RAL	78900

Average	23744	3803
SAMPLE ID	Pre-Remediation Conc. (mg/kg)	Post-Remediation Conc. (mg/kg)
SAMPLE ID	475000	50
CSB-10A-D	467000	50
CSB12A	460000	50
CSB4B	372000	50
CSB12B	351000	50
CSB11B	350000	50
CSB-35A-C	288000	50
CSB-10A-F	288000	50
CSB1B	256000	50
CSB-10A-C	255000	50
CSB7A	249000	50
CSB-1A-D	236000	50
CSB10B	192000	50
CSB4A	180000	50
CSB2C	175000	50
CSB2A	164000	50
CSB-32A-A	154000	50
CSB7B	150000	50
CSB3B	139000	50
CSB1A	132000	50
CSB10A	121000	50
CSB3A	104000	50
CSB11A	94500	50
CSB34A	93900	50
CSB3D	90100	50
CSB-32A-B	83800	50
CSB8A	83500	50
RSB25A	78100	78100
CSB3C	77200	77200
CSB7C	70400	70400
CSB-35A-A	66800	66800
RSB71A	64000	64000
CSB-32A-C	58400	58400
CSB2B	57200	57200
RSED6A	47300	47300
CSB51A	46800	46800
CSB39A	42800	42800
CSB32A	32000	32000
RSB58A	27400	27400
RSB31B	27400	27400
RSB55A	27000	27000
RSB55B	23700	23700
RSB31A	22800	22800
RSB54A	21000	21000
RSB58B	18700	18700
CSB51D	17500	17500
RSB12B	17400	17400
RSB57B	17300	17300

Construction Worker 2	
PRG	920
RAL	8470

Average	23744	507
SAMPLE ID	Pre-Remediation Conc. (mg/kg)	Post-Remediation Conc. (mg/kg)
SAMPLE ID	475000	50
CSB-10A-D	467000	50
CSB12A	460000	50
CSB4B	372000	50
CSB12B	351000	50
CSB11B	350000	50
CSB-35A-C	288000	50
CSB-10A-F	288000	50
CSB1B	256000	50
CSB-10A-C	255000	50
CSB7A	249000	50
CSB-1A-D	236000	50
CSB10B	192000	50
CSB4A	180000	50
CSB2C	175000	50
CSB2A	164000	50
CSB-32A-A	154000	50
CSB7B	150000	50
CSB3B	139000	50
CSB1A	132000	50
CSB10A	121000	50
CSB3A	104000	50
CSB11A	94500	50
CSB34A	93900	50
CSB3D	90100	50
CSB-32A-B	83800	50
CSB8A	83500	50
RSB25A	78100	50
CSB3C	77200	50
CSB7C	70400	50
CSB-35A-A	66800	50
RSB71A	64000	50
CSB-32A-C	58400	50
CSB2B	57200	50
RSED6A	47300	50
CSB51A	46800	50
CSB39A	42800	50
CSB32A	32000	50
RSB58A	27400	50
RSB31B	27400	50
RSB55A	27000	50
RSB55B	23700	50
RSB31A	22800	50
RSB54A	21000	50
RSB58B	18700	50
CSB51D	17500	50
RSB12B	17400	50
RSB57B	17300	50

Onsite Main Facility Area
Individual Sample Data

Construction Worker 1	
PRG	4600
RAL	78900

Construction Worker 2	
PRG	920
RAL	8470

MATRIX	Station	SAMPLE ID	DEPTH	Arsenic	Lead
SOIL	RSB57	RSB57A	0-3"	235	17000
SED	RSED6	RSED6B	6-12"	114	14800
SOIL	RSB55	RSB55C	24-30"	60	13100
SOIL	CSB51	CSB51E	36-39"	28	12000
SOIL	RSB12	RSB12A	0-3"	95	11100
SOIL	RSB58	RSB58C	24-30"	37	11100
SOIL	CSB35	CSB35D	24-28"	12	10800
SOIL	RSB77	RSB77A	0-3"	7	10700
SOIL	CSB51	CSB51B	6-9"	187	10300
SOIL	RSB28	RSB28A	0-3"	175	9670
SOIL	RSB14	RSB14B	3-10"	15	8480
SOIL	RSB26	RSB26B	3-10"	184	8130
SOIL	RSB14	RSB14A	0-3"	24	8100
SOIL	CSB51	CSB51F	48-51"	18	8020
SOIL	RSB25	RSB25B	3-10"	104	7930
SOIL	RSB73	RSB73A	0-3"	18	6710
SOIL	CSB40	CSB40A	0-3"	39	6680
SOIL	CSB38	CSB-38A-A	0-3"	87	6200
SOIL	CSB51	CSB51C	12-15"	17	5680
SOIL	CSB35	CSB35E	36-39"	15	4910
SOIL	RSB57	RSB57C	24-30"	16	3850
SOIL	RSB75	RSB75A	0-3"	58	3220
SOIL	RSB28	RSB28A	0-3"	56	3140
SOIL	CSB35	CSB35A	0-3"	8.4	3090
SOIL	RSB78	RSB78A	0-3"	14	3060
SOIL	CSB35	CSB35F	48-51"	12	3010
SOIL	RSB78	RSB78C	24-30"	13	2960
SOIL	RSB77	RSB77B	3-10"	7.7	2920
SOIL	RSB78	RSB78B	3-10"	12	2800
SOIL	CSB25	CSB25B	6-9"	75	2420
SOIL	CSB30	CSB-30A-A	0-3"	30	2360
SOIL	CSB34	CSB34B	6-9"	9.1	2360
SOIL	CSB13	CSB-13A-A	0-3"	11	2300
SOIL	CSB31	CSB31B	6-9"	22	2280
SOIL	RSB33	RSB33A	0-3"	58	2200
SOIL	RSB38	RSB38A	0-3"	14	2000
SOIL	CSB-10	CSB-10A-A	0-3"	4.5	1780
SOIL	CSB-10	CSB10C	12-15"	17	1500
SOIL	RSB75	RSB75B	3-10"	15	1500
SOIL	RSB29	RSB29A	0-3"	23	1480
SOIL	CSB35	CSB35C	12-15"	7	1400
SOIL	CSB-10	CSB-10A-B	6-9"	8.1	1210
SOIL	CSB13	CSB-13A-B	6-9"	22	1070
SOIL	RSB15	RSB15A	0-3"	22	1070
SOIL	CSB8	CSB8B	6-9"	10	989
SOIL	RSB23	RSB23A	0-3"	18	987
SOIL	RSB75	RSB75C	24-30"	12	962
SOIL	CSB1	CSB-1A-A	0-3"	3.2	903

Average	23744	3803
SAMPLE ID	Pre-Remediation Conc. (mg/kg)	Post-Remediation Conc. (mg/kg)
RSB54B	17000	17000
RSB57A	14800	14800
RSED6B	13100	13100
RSB55C	12000	12000
CSB51E	11100	11100
RSB12A	11100	11100
RSB58C	10800	10800
CSB35D	10700	10700
RSB77A	10300	10300
CSB51B	9670	9670
RSB28A	8480	8480
RSB14B	8130	8130
RSB26B	8100	8100
RSB14A	8020	8020
CSB51F	7930	7930
RSB25B	6710	6710
RSB73A	6680	6680
CSB40A	6200	6200
CSB-38A-A	5680	5680
CSB51C	4910	4910
CSB35E	3850	3850
RSB57C	3220	3220
RSB75A	3140	3140
RSB28A	3090	3090
CSB35A	3060	3060
RSB78A	3010	3010
CSB35F	2960	2960
RSB78C	2920	2920
RSB77B	2800	2800
RSB78B	2420	2420
CSB25B	2360	2360
CSB-30A-A	2360	2360
CSB34B	2300	2300
CSB-13A-A	2280	2280
CSB31B	2200	2200
RSB33A	2000	2000
RSB38A	1780	1780
CSB-10A-A	1500	1500
CSB10C	1500	1500
RSB75B	1480	1480
RSB29A	1400	1400
CSB35C	1210	1210
CSB-10A-B	1070	1070
CSB-13A-B	1070	1070
RSB15A	989	989
CSB8B	987	987
RSB23A	962	962
RSB75C	903	903

Average	23744	507
SAMPLE ID	Pre-Remediation Conc. (mg/kg)	Post-Remediation Conc. (mg/kg)
RSB54B	17000	50
RSB57A	14800	50
RSED6B	13100	50
RSB55C	12000	50
CSB51E	11100	50
RSB12A	11100	50
RSB58C	10800	50
CSB35D	10700	50
RSB77A	10300	50
CSB51B	9670	50
RSB28A	8480	50
RSB14B	8130	8130
RSB26B	8100	8100
RSB14A	8020	8020
CSB51F	7930	7930
RSB25B	6710	6710
RSB73A	6680	6680
CSB40A	6200	6200
CSB-38A-A	5680	5680
CSB51C	4910	4910
CSB35E	3850	3850
RSB57C	3220	3220
RSB75A	3140	3140
RSB28A	3090	3090
CSB35A	3060	3060
RSB78A	3010	3010
CSB35F	2960	2960
RSB78C	2920	2920
RSB77B	2800	2800
RSB78B	2420	2420
CSB25B	2360	2360
CSB-30A-A	2360	2360
CSB34B	2300	2300
CSB-13A-A	2280	2280
CSB31B	2200	2200
RSB33A	2000	2000
RSB38A	1780	1780
CSB-10A-A	1500	1500
CSB10C	1500	1500
RSB75B	1480	1480
RSB29A	1400	1400
CSB35C	1210	1210
CSB-10A-B	1070	1070
CSB-13A-B	1070	1070
RSB15A	989	989
CSB8B	987	987
RSB23A	962	962
RSB75C	903	903

Onsite Main Facility Area
Individual Sample Data

Construction Worker 1	
PRG	4600
RAL	78900

Construction Worker 2	
PRG	920
RAL	8470

MATRIX	Station	SAMPLE ID	DEPTH	Arsenic	Lead
SOIL	CSB33	CSB33B	6-9"	12	868
SOIL	CSB1	CSB-1A-E	36-39"	8.8	847
SOIL	RSB32	RSB32A	0-3"	13	841
SOIL	CSB32	CSB32C	12-15"	7	694
SOIL	RSB37	RSB37A	0-3"	17	679
SOIL	RSB76	RSB76B	3-10"	10	648
SOIL	RSB37	RSB37B	3-10"	13	594
SOIL	RSB20	RSB20A	0-3"	14	593
SOIL	CSB26	CSB26C	12-15"	8.6	583
SOIL	CSB-10	CSB10D	12-15"	8.9	548
SOIL	RSB32	RSB32B	3-10"	7.7	531
SOIL	RSB17	RSB17A	0-3"	10	530
SOIL	RSB18	RSB18A	0-3"	7.8	526
SOIL	CSB11	CSB11C	12-15"	14	522
SOIL	CSB35	CSB35B	6-9"	9.5	518
SOIL	CSB1	CSB1C	12-15"	8	511
SOIL	CSB35	CSB-35A-E	36-39"	8.3	499
SOIL	CSB50	CSB50A	0-3"	15	480
SOIL	RSB22	RSB22A	0-3"	21	478
SOIL	RSB28	RSB28B	3-10"	16	478
SOIL	RSB38	RSB38B	3-10"	7.2	440
SOIL	CSB31	CSB31A	0-3"	14	431
SOIL	CSB25	CSB25A	0-3"	13	411
SOIL	CSB32	CSB32B	6-9"	7.4	403
SOIL	RSB74	RSB74A	0-3"	13	380
SOIL	CSB30	CSB-30A-B	6-9"	13	366
SOIL	CSB12	CSB12C	12-15"	14	353
SOIL	RSB29	RSB29B	3-10"	11	350
SOIL	CSB21	CSB21B	6-9"	9.3	329
SOIL	CSB37	CSB37A	0-3"	30	325
SOIL	CSB13	CSB13A	0-3"	38	323
SOIL	CSB38	CSB-38A-E	36-39"	8.6	319
SOIL	CSB37	CSB37B	6-9"	7.9	314
SOIL	CSB9	CSB9A	0-3"	12	289
SOIL	CSB35	CSB-35A-D	24-27"	6	285
SOIL	CSB35	CSB-35A-B	6-9"	8.1	279
SOIL	CSB8	CSB8C	12-15"	10	279
SOIL	CSB-10	CSB-10A-E	36-39"	7.1	253
SOIL	CSB33	CSB33C	12-15"	13	245
SOIL	CSB30	CSB-30A-C	12-15"	8.1	243
SOIL	CSB37	CSB37C	12-15"	8.8	242
SOIL	RSB22	RSB22B	3-10"	10	237
SOIL	CSB16	CSB16C	12-15"	7.5	234
SOIL	CSB3	CSB3E	36-39"	12	232
SOIL	RSB77	RSB77C	24-30"	8.8	232
SOIL	CSB50	CSB50C	12-15"	10	229
SOIL	RSB81	RSB81A	0-3"	9.4	229
SOIL	RSB15	RSB15B	3-10"	10	211

Average	23744	3803
SAMPLE ID	Pre-Remediation Conc. (mg/kg)	Post-Remediation Conc. (mg/kg)
CSB-1A-A	868	868
CSB33B	847	847
CSB-1A-E	841	841
RSB32A	694	694
CSB32C	679	679
RSB37A	648	648
RSB76B	594	594
RSB37B	593	593
RSB20A	583	583
CSB26C	548	548
CSB10D	531	531
RSB32B	530	530
RSB17A	526	526
RSB18A	522	522
CSB11C	518	518
CSB35B	511	511
CSB1C	499	499
CSB-35A-E	480	480
CSB50A	478	478
RSB22A	478	478
RSB28B	440	440
RSB38B	431	431
CSB31A	411	411
CSB25A	403	403
CSB32B	380	380
RSB74A	366	366
CSB-30A-B	353	353
CSB12C	350	350
RSB29B	329	329
CSB21B	325	325
CSB37A	323	323
CSB13A	319	319
CSB-38A-E	314	314
CSB37B	289	289
CSB9A	285	285
CSB-35A-D	279	279
CSB-35A-B	279	279
CSB8C	253	253
CSB-10A-E	245	245
CSB33C	243	243
CSB-30A-C	242	242
CSB37C	237	237
RSB22B	234	234
CSB16C	232	232
CSB3E	232	232
RSB77C	229	229
CSB50C	229	229
RSB81A	211	211

Average	23744	507
SAMPLE ID	Pre-Remediation Conc. (mg/kg)	Post-Remediation Conc. (mg/kg)
CSB-1A-A	868	868
CSB33B	847	847
CSB-1A-E	841	841
RSB32A	694	694
CSB32C	679	679
RSB37A	648	648
RSB76B	594	594
RSB37B	593	593
RSB20A	583	583
CSB26C	548	548
CSB10D	531	531
RSB32B	530	530
RSB17A	526	526
RSB18A	522	522
CSB11C	518	518
CSB35B	511	511
CSB1C	499	499
CSB-35A-E	480	480
CSB50A	478	478
RSB22A	478	478
RSB28B	440	440
RSB38B	431	431
CSB31A	411	411
CSB25A	403	403
CSB32B	380	380
RSB74A	366	366
CSB-30A-B	353	353
CSB12C	350	350
RSB29B	329	329
CSB21B	325	325
CSB37A	323	323
CSB13A	319	319
CSB-38A-E	314	314
CSB37B	289	289
CSB9A	285	285
CSB-35A-D	279	279
CSB-35A-B	279	279
CSB8C	253	253
CSB-10A-E	245	245
CSB33C	243	243
CSB-30A-C	242	242
CSB37C	237	237
RSB22B	234	234
CSB16C	232	232
CSB3E	232	232
RSB77C	229	229
CSB50C	229	229
RSB81A	211	211

Onsite Main Facility Area
Individual Sample Data

Construction Worker 1	
PRG	4600
RAL	78900

Construction Worker 2	
PRG	920
RAL	8470

MATRIX	Station	SAMPLE ID	DEPTH	Arsenic	Lead
SOIL	CSB16	CSB16A	0-3"	8	209
SOIL	RSB79	RSB79B	3-10"	6.9	205
SOIL	CSB33	CSB33A	0-3"	13	196
SOIL	CSB16	CSB16B	6-9"	7.2	195
SOIL	CSB26	CSB26A	0-3"	7.7	191
SOIL	CSB19	CSB19A	0-3"	9	187
SOIL	RSB73	RSB73C	24-30"	7.8	178
SOIL	RSB74	RSB74B	3-10"	9	177
SOIL	CSB-26	CSB-26A-A	0-3"	12	174
SOIL	CSB1	CSB-1A-F	48-51"	8.5	170
SOIL	CSB6	CSB6A	0-3"	8.9	165
SOIL	RSB79	RSB79C	24-30"	8.1	164
SOIL	RSB23	RSB23B	3-10"	2.8	157
SOIL	RSB54	RSB54C	24-30"	3.4	151
SOIL	CSB49	CSB49A	0-3"	8.1	147
SOIL	RSB73	RSB73B	3-10"	11	145
SOIL	CSB9	CSB9B	6-9"	11	132
SOIL	CSB50	CSB50B	6-9"	13	131
SOIL	CSB19	CSB19C	12-15"	6.7	129
SOIL	CSB5	CSB5A	0-3"	7.2	125
SOIL	CSB7	CSB7D	24-28"	6.9	114
SOIL	CSB25	CSB25C	12-15"	8.8	108
SOIL	CSB36	CSB36A	0-3"	170	103
SOIL	CSB17	CSB17C	12-15"	6.9	101
SOIL	RSB20	RSB20B	3-10"	10	97
SOIL	CSB15	CSB15B	6-9"	7.8	89
SOIL	CSB-26	CSB-26A-B	6-9"	11	88
SOIL	RSB56	RSB56C	24-30"	6.1	88
SOIL	CSB17	CSB17A	0-3"	7.3	87
SOIL	RSB80	RSB80A	0-3"	7.4	85
SOIL	CSB19	CSB19B	6-9"	6.8	79
SOIL	RSB62	RSB62B	3-10"	5.9	77
SOIL	CSB36	CSB36B	6-9"	15	76
SOIL	CSB13	CSB-13A-C	12-15"	6.6	75
SOIL	RSB74	RSB74C	24-30"	4.9	75
SOIL	CSB26	CSB26B	6-9"	6.5	73
SOIL	RSB76	RSB76C	24-30"	7.7	72
SOIL	CSB18	CSB18A	0-3"	7.8	70
SOIL	CSB35	CSB-35A-F	48-51"	6.3	69
SOIL	CSB39	CSB39B	6-9"	8	69
SOIL	CSB6	CSB6C	12-15"	11	69
SOIL	CSB34	CSB34C	12-15"	7	68
SOIL	CSB36	CSB36C	12-15"	12	67
SOIL	CSB5	CSB5B	6-9"	7.1	67
SOIL	RSB52	RSB52C	24-30"	6.9	67
SOIL	CSB4	CSB4C	12-15"	6.8	65
SOIL	RSB79	RSB79A	0-3"	6.5	57
SOIL	CSB9	CSB9C	12-15"	7.7	53

Average	23744	3803
SAMPLE ID	Pre-Remediation Conc. (mg/kg)	Post-Remediation Conc. (mg/kg)
RSB15B	209	209
CSB16A	205	205
RSB79B	196	196
CSB33A	195	195
CSB16B	191	191
CSB26A	187	187
CSB19A	178	178
RSB73C	177	177
RSB74B	174	174
CSB-26A-A	170	170
CSB-1A-F	165	165
CSB6A	164	164
RSB79C	157	157
RSB23B	151	151
RSB54C	147	147
CSB49A	145	145
RSB73B	132	132
CSB9B	131	131
CSB50B	129	129
CSB19C	125	125
CSB5A	114	114
CSB7D	108	108
CSB25C	103	103
CSB36A	101	101
CSB17C	97	97
RSB20B	89	89
CSB15B	88	88
CSB-26A-B	88	88
RSB56C	87	87
CSB17A	85	85
RSB80A	79	79
CSB19B	77	77
RSB52B	76	76
CSB36B	75	75
CSB-13A-C	75	75
RSB74C	73	73
CSB26B	72	72
RSB76C	70	70
CSB18A	69	69
CSB-35A-F	69	69
CSB39B	69	69
CSB6C	68	68
CSB34C	67	67
CSB36C	67	67
CSB5B	67	67
RSB52C	65	65
CSB4C	57	57
RSB79A	53	53

Average	23744	507
SAMPLE ID	Pre-Remediation Conc. (mg/kg)	Post-Remediation Conc. (mg/kg)
RSB15B	209	209
CSB16A	205	205
RSB79B	196	196
CSB33A	195	195
CSB16B	191	191
CSB26A	187	187
CSB19A	178	178
RSB73C	177	177
RSB74B	174	174
CSB-26A-A	170	170
CSB-1A-F	165	165
CSB6A	164	164
RSB79C	157	157
RSB23B	151	151
RSB54C	147	147
CSB49A	145	145
RSB73B	132	132
CSB9B	131	131
CSB50B	129	129
CSB19C	125	125
CSB5A	114	114
CSB7D	108	108
CSB25C	103	103
CSB36A	101	101
CSB17C	97	97
RSB20B	89	89
CSB15B	88	88
CSB-26A-B	88	88
RSB56C	87	87
CSB17A	85	85
RSB80A	79	79
CSB19B	77	77
RSB52B	76	76
CSB36B	75	75
CSB-13A-C	75	75
RSB74C	73	73
CSB26B	72	72
RSB76C	70	70
CSB18A	69	69
CSB-35A-F	69	69
CSB39B	69	69
CSB6C	68	68
CSB34C	67	67
CSB36C	67	67
CSB5B	67	67
RSB52C	65	65
CSB4C	57	57
RSB79A	53	53

Onsite Main Facility Area
Individual Sample Data

MATRIX	Station	SAMPLE ID	DEPTH	Arsenic	Lead
SOIL	CSB6	CSB6B	6-9"	9.6	50
SOIL	RSB18	RSB18B	3-10"	6.3	50
SOIL	CSB13	CSB13C	12-15"	10	49
SOIL	CSB41	CSB41A	0-3"	4.8	45
SOIL	CSB1	CSB-1A-C	12-15"	1.5	44
SOIL	CSB29	CSB29B	6-9"	25	44
SOIL	CSB5	CSB5C	12-15"	5.1	42
SOIL	CSB-28	CSB-28A-C	12-15"	6.4	40
SOIL	CSB32	CSB-32A-D	24-27"	8	40
SOIL	CSB13	CSB-13A-D	24-27"	5.9	39
SOIL	CSB18	CSB18C	12-15"	8.3	38
SOIL	RSB82	RSB82B	3-10"	24	37
SOIL	CSB29	CSB29C	12-15"	11	36
SOIL	RSB72	RSB72A	0-3"	8.7	34
SOIL	CSB21	CSB21C	12-15"	6.8	32
SOIL	CSB23	CSB23C	12-15"	6.2	32
SOIL	CSB29	CSB29A	0-3"	9.2	32
SOIL	CSB30	CSB-30A-D	24-27"	6.8	32
SOIL	CSB21	CSB21A	0-3"	7.8	31
SOIL	RSB63	RSB63C	24-30"	16	31
SOIL	CSB13	CSB13B	6-9"	11	30
SOIL	CSB20	CSB20A	0-3"	9.6	30
SOIL	CSB28	CSB-28A-A	0-3"	53	30
SOIL	RSB56	RSB56A	0-3"	8.6	30
SOIL	CSB28	CSB28C	12-15"	23	29
SOIL	CSB14	CSB14A	0-3"	2.2	28
SOIL	CSB15	CSB15C	12-15"	5.3	28
SOIL	CSB24	CSB24A	0-3"	4.8	28
SOIL	CSB13	CSB-13A-E	36-39"	6	27
SOIL	CSB28	CSB-28A-C	12-15"	7.9	27
SOIL	RSB56	RSB56B	3-10"	7.7	27
SOIL	CSB18	CSB18B	6-9"	6	26
SOIL	CSB-28	CSB-28A-D	24-27"	8.2	25
SOIL	RSB52	RSB52A	0-3"	6.6	25
SOIL	CSB20	CSB20C	12-15"	2.4	23
SOIL	CSB-28	CSB-28A-E	36-39"	5.8	23
SOIL	RSB80	RSB80B	3-10"	7	23
SOIL	RSB80	RSB80C	24-30"	8.7	23
SOIL	CSB27	CSB27A	0-3"	6.3	22
SOIL	CSB36	CSB36A	0-3"	4.9	22
SOIL	CSB36	CSB-36A-C	12-15"	9.3	22
SOIL	RSB33	RSB33B	3-10"	10	22
SOIL	RSB17	RSB17B	3-10"	9.7	21
SOIL	RSB53	RSB53A	0-3"	8.2	21
SOIL	RSB84	RSB84B	3-10"	15	21
SOIL	CSB17	CSB17B	6-9"	7.1	20
SOIL	CSB24	CSB24B	6-9"	9.3	20
SOIL	CSB32	CSB-32A-E	36-39"	6.5	20

Construction Worker 1	
PRG	4600
RAL	78900

Average	23744	3803
SAMPLE ID	Pre-Remediation Conc. (mg/kg)	Post-Remediation Conc. (mg/kg)
CSB9C	50	50
CSB6B	50	50
RSB18B	49	49
CSB13C	45	45
CSB41A	44	44
CSB-1A-C	44	44
CSB29B	42	42
CSB5C	40	40
CSB-28A-C	40	40
CSB-32A-D	39	39
CSB-13A-D	38	38
CSB18C	37	37
RSB82B	36	36
CSB29C	34	34
RSB72A	32	32
CSB21C	32	32
CSB23C	32	32
CSB29A	32	32
CSB-30A-D	31	31
CSB21A	31	31
RSB63C	30	30
CSB13B	30	30
CSB20A	30	30
CSB-28A-A	30	30
RSB56A	29	29
CSB28C	28	28
CSB14A	28	28
CSB15C	28	28
CSB24A	27	27
CSB-13A-E	27	27
CSB-28A-C	27	27
RSB56B	26	26
CSB18B	25	25
CSB-28A-D	25	25
RSB52A	23	23
CSB20C	23	23
CSB-28A-E	23	23
RSB80B	23	23
RSB80C	22	22
CSB27A	22	22
CSB36A	22	22
CSB-36A-C	22	22
RSB33B	21	21
RSB17B	21	21
RSB53A	21	21
RSB84B	20	20
CSB17B	20	20
CSB24B	20	20

Construction Worker 2	
PRG	920
RAL	8470

Average	23744	507
SAMPLE ID	Pre-Remediation Conc. (mg/kg)	Post-Remediation Conc. (mg/kg)
CSB9C	50	50
CSB6B	50	50
RSB18B	49	49
CSB13C	45	45
CSB41A	44	44
CSB-1A-C	44	44
CSB29B	42	42
CSB5C	40	40
CSB-28A-C	40	40
CSB-32A-D	39	39
CSB-13A-D	38	38
CSB18C	37	37
RSB82B	36	36
CSB29C	34	34
RSB72A	32	32
CSB21C	32	32
CSB23C	32	32
CSB28A	32	32
CSB-30A-D	31	31
CSB21A	31	31
RSB63C	30	30
CSB13B	30	30
CSB20A	30	30
CSB-28A-A	30	30
RSB56A	29	29
CSB28C	28	28
CSB14A	28	28
CSB15C	28	28
CSB24A	27	27
CSB-13A-E	27	27
CSB-28A-C	27	27
RSB56B	26	26
CSB18B	25	25
CSB-28A-D	25	25
RSB52A	23	23
CSB20C	23	23
CSB-28A-E	23	23
RSB80B	23	23
RSB80C	22	22
CSB27A	22	22
CSB36A	22	22
CSB-36A-C	22	22
RSB33B	21	21
RSB17B	21	21
RSB53A	21	21
RSB84B	20	20
CSB17B	20	20
CSB24B	20	20

Onsite Main Facility Area
Individual Sample Data

Construction Worker 1	
PRG	4600
RAL	78900

Construction Worker 2	
PRG	920
RAL	8470

MATRIX	Station	SAMPLE ID	DEPTH	Arsenic	Lead
SOIL	CSB40	CSB40B	6-9"	6.4	20
SOIL	CSB20	CSB20B	6-9"	8.9	19
SOIL	CSB28	CSB28B	6-9"	10	19
SOIL	CSB38	CSB38C	12-15"	7.8	19
SOIL	CSB7	CSB7E	36-39"	6.2	19
SOIL	RSB34	RSB34A	0-3"	8.5	19
SOIL	RSB34	RSB34B	3-10"	6.3	19
SOIL	CSB1	CSB-1A-B	6-9"	1.5	18
SOIL	CSB14	CSB14C	12-15"	6.4	18
SOIL	CSB49	CSB49B	6-9"	6.4	18
SOIL	RSB53	RSB53B	3-10"	8.3	18
SOIL	RSB81	RSB81B	3-10"	9.3	18
SOIL	CSB49	CSB49C	12-15"	6.8	17
SOIL	RSB53	RSB53C	24-30"	6.9	17
SOIL	RSB83	RSB83A	0-3"	9.9	17
SOIL	CSB28	CSB-28A-E	36-39"	9.4	16
SOIL	CSB30	CSB30A	0-3"	9.5	16
SOIL	RSB82	RSB82A	0-3"	8.5	16
SOIL	RSB82	RSB82C	24-30"	9.3	16
SOIL	RSB84	RSB84A	0-3"	10	16
SOIL	CSB30	CSB30C	12-15"	11	15
SOIL	CSB38	CSB38B	6-9"	4.4	15
SOIL	CSB39	CSB39C	12-15"	5.8	15
SOIL	CSB42	CSB42C	12-15"	7.8	15
SOIL	RSB72	RSB72B	3-10"	7	15
SOIL	RSB72	RSB72C	24-30"	8.2	15
SOIL	CSB27	CSB27C	12-15"	8.4	14
SOIL	CSB28	CSB28A	0-3"	4.4	14
SOIL	CSB28	CSB-28A-D	24-27"	6.5	14
SOIL	CSB38	CSB-38A-B	6-9"	7.9	14
SOIL	CSB40	CSB40C	12-15"	11	14
SOIL	RSB27	RSB27A	0-3"	8.1	14
SOIL	RSB27	RSB27B	3-10"	8.5	14
SOIL	CSB27	CSB27B	6-9"	8.5	13
SOIL	CSB28	CSB-28A-B	6-9"	5.1	13
SOIL	CSB30	CSB-30A-E	36-39"	6.6	13
SOIL	CSB30	CSB30B	6-9"	6.7	13
SOIL	RSB19	RSB19B	3-10"	6.8	13
SOIL	CSB24	CSB24C	12-15"	4.4	12
SOIL	CSB38	CSB-38A-D	24-27"	2.5	12
SOIL	RSB84	RSB84C	24-30"	5.7	12
SOIL	CSB23	CSB23B	6-9"	7	11
SOIL	CSB42	CSB42A	0-3"	23	11
SOIL	CSB42	CSB42B	6-9"	73	11
SOIL	RSB19	RSB19A	0-3"	7	11
SOIL	RSB81	RSB81C	24-30"	7	11
SOIL	RSB83	RSB83B	3-10"	7.4	11
SOIL	CSB23	CSB23A	0-3"	7.5	10

Average	23744	3803
SAMPLE ID	Pre-Remediation Conc. (mg/kg)	Post-Remediation Conc. (mg/kg)
CSB-32A-E	20	20
CSB40B	19	19
CSB20B	19	19
CSB28B	19	19
CSB38C	19	19
CSB7E	19	19
RSB34A	19	19
RSB34B	18	18
CSB-1A-B	18	18
CSB14C	18	18
CSB49B	18	18
RSB53B	18	18
RSB81B	17	17
CSB49C	17	17
RSB53C	17	17
RSB83A	16	16
CSB-28A-E	16	16
CSB30A	16	16
RSB82A	16	16
RSB82C	16	16
RSB84A	15	15
CSB30C	15	15
CSB38B	15	15
CSB39C	15	15
CSB42C	15	15
RSB72B	15	15
RSB72C	14	14
CSB27C	14	14
CSB28A	14	14
CSB-28A-D	14	14
CSB-38A-B	14	14
CSB40C	14	14
RSB27A	14	14
RSB27B	13	13
CSB27B	13	13
CSB-28A-B	13	13
CSB-30A-E	13	13
CSB30B	13	13
RSB19B	12	12
CSB24C	12	12
CSB-38A-D	12	12
RSB84C	11	11
CSB23B	11	11
CSB42A	11	11
CSB42B	11	11
RSB19A	11	11
RSB81C	11	11
RSB83B	10	10

Average	23744	807
SAMPLE ID	Pre-Remediation Conc. (mg/kg)	Post-Remediation Conc. (mg/kg)
CSB-32A-E	20	20
CSB40B	19	19
CSB20B	19	19
CSB28B	19	19
CSB38C	19	19
CSB7E	19	19
RSB34A	19	19
RSB34B	18	18
CSB-1A-B	18	18
CSB14C	18	18
CSB49B	18	18
RSB53B	18	18
RSB81B	17	17
CSB49C	17	17
RSB53C	17	17
RSB83A	16	16
CSB-28A-E	16	16
CSB30A	16	16
RSB82A	16	16
RSB82C	16	16
RSB84A	15	15
CSB30C	15	15
CSB38B	15	15
CSB39C	15	15
CSB42C	15	15
RSB72B	15	15
RSB72C	14	14
CSB27C	14	14
CSB28A	14	14
CSB-28A-D	14	14
CSB-38A-B	14	14
CSB40C	14	14
RSB27A	14	14
RSB27B	13	13
CSB27B	13	13
CSB-28A-B	13	13
CSB-30A-E	13	13
CSB30B	13	13
RSB19B	12	12
CSB24C	12	12
CSB-38A-D	12	12
RSB84C	11	11
CSB23B	11	11
CSB42A	11	11
CSB42B	11	11
RSB19A	11	11
RSB81C	11	11
RSB83B	10	10

Onsite Main Facility Area
Individual Sample Data

MATRIX	Station	SAMPLE ID	DEPTH	Arsenic	Lead
SOIL	CSB31	CSB31C	12-15"	6.7	10
SOIL	CSB14	CSB14B	6-9"	5.7	9.8
SOIL	CSB22	CSB22C	12-15"	6.6	9.8
SOIL	CSB15	CSB15A	0-3"	7	9.6
SOIL	RSB85	RSB85A	0-3"	7.1	9.1
SOIL	CSB41	CSB41B	6-9"	7.6	8.9
SOIL	CSB41	CSB41C	12-15"	6.3	8.8
SOIL	RSB85	RSB85C	24-30"	7	8.7
SOIL	RSB85	RSB85B	3-10"	6.7	8.2
SOIL	CSB22	CSB22A	0-3"	6.3	8
SOIL	CSB22	CSB22B	6-9"	6.7	7.7
SOIL	RSB76	RSB76A	0-3"	24	4.7

Construction Worker 1	
PRG	4600
RAL	78900

Average	23744	3803
SAMPLE ID	Pre-Remediation Conc. (mg/kg)	Post-Remediation Conc. (mg/kg)
CSB23A	10	10
CSB31C	9.8	9.8
CSB14B	9.8	9.8
CSB22C	9.6	9.6
CSB15A	9.1	9.1
RSB85A	8.9	8.9
CSB41B	8.8	8.8
CSB41C	8.7	8.7
RSB85C	8.2	8.2
RSB85B	8	8
CSB22A	7.7	7.7
CSB22B	4.7	4.7

Construction Worker 2	
PRG	920
RAL	8470

Average	23744	507
SAMPLE ID	Pre-Remediation Conc. (mg/kg)	Post-Remediation Conc. (mg/kg)
CSB23A	10	10
CSB31C	9.8	9.8
CSB14B	9.8	9.8
CSB22C	9.6	9.6
CSB15A	9.1	9.1
RSB85A	8.9	8.9
CSB41B	8.8	8.8
CSB41C	8.7	8.7
RSB85C	8.2	8.2
RSB85B	8	8
CSB22A	7.7	7.7
CSB22B	4.7	4.7

Grassy Area Lead Data (0-6 inches)
Soil and Sediment combined

Worker	Lead (ppm)
PRG	3,195
RAL	16,665

MATRIX	Station	DEPTH	Conc. (mg/kg)
SED	RSED4	0-6"	243000
SED	RSED5	0-6"	228000
SED	RSED3	0-6"	95300
SED	RSED2	0-6"	73800
SED	RSED7	0-6"	46000
SED	RSED8	0-6"	34800
SED	RSED9	0-6"	32400
SED	RSED10	0-6"	29300
SED	RSED1	0-6"	19300
SOIL	RSB9	0-3"	14500
SOIL	RSB51	0-3"	12600
SOIL	RSB-70	0-3"	6420
SOIL	RSB50	0-3"	5470
SOIL	RSB4	0-3"	2360
SOIL	RSB24	0-3"	1980
SOIL	RSB6	0-3"	1880
SOIL	RSB10	0-3"	1850
SOIL	BSB2	0-3"	1200
SOIL	RSB7	0-3"	1150
SOIL	RSB43	0-3"	1130
SOIL	RSB2	0-3"	1100
SOIL	BSB4	0-3"	1060
SOIL	RSB49	0-3"	1060
SOIL	RSB8	0-3"	1050
SOIL	RSB5	0-3"	985
SOIL	RSB40	0-3"	901
SOIL	RSB30	0-3"	887
SOIL	RSB1	0-3"	873
SOIL	RSB42	0-3"	834
SOIL	RSB13	0-3"	682
SOIL	RSB16	0-3"	661
SOIL	RSB11	0-3"	641
SOIL	RSB3	0-3"	632
SOIL	RSB21	0-3"	497
SOIL	RSB45	0-3"	487
SOIL	RSB46	0-3"	385
SOIL	RSB44	0-3"	369
SOIL	RSB41	0-3"	341
SOIL	BSB3	0-3"	257
SOIL	RSB39	0-3"	227
SOIL	RSB36	0-3"	216
SOIL	BSB1	0-3"	158
SOIL	RSB35	0-3"	43
		Average Soil and Sediment	20,158
		Average Soil	1908
		Average Sediment	89,100

Average	20,158	1,519
SAMPLE ID	Pre-Remediation Conc. (mg/kg)	Post-Remediation Conc. (mg/kg)
RSED4	243000	50
RSED5	228000	50
RSED3	95300	50
RSED2	73800	50
RSED7	46000	50
RSED8	34800	50
RSED9	32400	50
RSED10	29300	50
RSED1	19300	50
RSB9	14500	14500
RSB51	12600	12600
RSB-70	6420	6420
RSB50	5470	5470
RSB4	2360	2360
RSB24	1980	1980
RSB6	1880	1880
RSB10	1850	1850
BSB2	1200	1200
RSB7	1150	1150
RSB43	1130	1130
RSB2	1100	1100
BSB4	1060	1060
RSB49	1060	1060
RSB8	1050	1050
RSB5	985	985
RSB40	901	901
RSB30	887	887
RSB1	873	873
RSB42	834	834
RSB13	682	682
RSB16	661	661
RSB11	641	641
RSB3	632	632
RSB21	497	497
RSB45	487	487
RSB46	385	385
RSB44	369	369
RSB41	341	341
BSB3	257	257
RSB39	227	227
RSB36	216	216
BSB1	158	158
RSB35	43	43

Grassy Area All Depths (0 - 30")
Soil and Sediment combined

Exposure Area	MATRIX	Station	DEPTH	Lead (mg/kg)
Grassy	SED	RSED4	0-6"	243000
Grassy	SED	RSED5	0-6"	228000
Grassy	SED	RSED5	6-12"	182000
Grassy	SED	RSED3	0-6"	95300
Grassy	SED	RSED2	0-6"	73800
Grassy	SED	RSED7	0-6"	46000
Grassy	SED	RSED8	0-6"	34800
Grassy	SED	RSED9	0-6"	32400
Grassy	SED	RSED1	6-12"	29900
Grassy	SED	RSED10	0-6"	29300
Grassy	SED	RSED8	6-12"	25900
Grassy	SED	RSED7	6-12"	20500
Grassy	SED	RSED1	0-6"	19300
Grassy	SED	RSED4	6-12"	17300
Grassy	SED	RSED10	6-12"	15300
Grassy	SED	RSED9	6-12"	14800
Grassy	SOIL	RSB9	0-3"	14500
Grassy	SOIL	RSB-70	3-10"	13100
Grassy	SOIL	RSB51	0-3"	12800
Grassy	SED	RSED3	8-12"	8420
Grassy	SOIL	RSB-70	0-3"	6420
Grassy	SOIL	RSB50	0-3"	5470
Grassy	SOIL	RSB51	3-10"	4430
Grassy	SED	RSED2	6-12"	4080
Grassy	SOIL	RSB9	3-10"	3800
Grassy	SOIL	RSB51	24-30"	3300
Grassy	SOIL	RSB4	0-3"	2360
Grassy	SOIL	RSB24	0-3"	1980
Grassy	SOIL	RSB6	0-3"	1880
Grassy	SOIL	RSB10	0-3"	1850
Grassy	SOIL	BSB2	0-3"	1200
Grassy	SOIL	RSB7	0-3"	1150
Grassy	SOIL	RSB43	0-3"	1130

Construction Worker 1	Lead (mg/kg)
PRG	4,500
RAL	43,300

Average	13,392	3,856
Station	Pre-Remediation Conc. (mg/kg)	Post-Remediation Conc. (mg/kg)
RSED4	243000	50
RSED5	228000	50
RSED5	182000	50
RSED3	95300	50
RSED2	73800	50
RSED7	46000	50
RSED8	34800	34800
RSED9	32400	32400
RSED1	29900	29900
RSED10	29300	29300
RSED8	25900	25900
RSED7	20500	20500
RSED1	19300	19300
RSED4	17300	17300
RSED10	15300	15300
RSED9	14800	14800
RSB9	14500	14500
RSB-70	13100	13100
RSB51	12600	12600
RSED3	8420	8420
RSB-70	6420	6420
RSB50	5470	5470
RSB51	4430	4430
RSED2	4080	4080
RSB9	3800	3800
RSB51	3300	3300
RSB4	2360	2360
RSB24	1980	1980
RSB6	1880	1880
RSB10	1850	1850
BSB2	1200	1200
RSB7	1150	1150
RSB43	1130	1130

Construction Worker 2	Lead (mg/kg)
PRG	920
RAL	4,954

Average	13,392	567
Station	Pre-Remediation Conc. (mg/kg)	Post-Remediation Conc. (mg/kg)
RSED4	243000	50
RSED5	228000	50
RSED5	182000	50
RSED3	95300	50
RSED2	73800	50
RSED7	46000	50
RSED8	34800	50
RSED9	32400	50
RSED1	29900	50
RSED10	29300	50
RSED8	25900	50
RSED7	20500	50
RSED1	19300	50
RSED4	17300	50
RSED10	15300	50
RSED9	14800	50
RSB9	14500	50
RSB-70	13100	50
RSB51	12600	50
RSED3	8420	50
RSB-70	6420	50
RSB50	5470	50
RSB51	4430	4430
RSED2	4080	4080
RSB9	3800	3800
RSB51	3300	3300
RSB4	2360	2360
RSB24	1980	1980
RSB6	1880	1880
RSB10	1850	1850
BSB2	1200	1200
RSB7	1150	1150
RSB43	1130	1130

Grassy Area All Depths (0 - 30")
Soil and Sediment combined

Exposure Area	MATRIX	Station	DEPTH	Lead (mg/kg)
Grassy	SOIL	RSB2	0-3"	1100
Grassy	SOIL	BSB4	0-3"	1060
Grassy	SOIL	RSB49	0-3"	1060
Grassy	SOIL	RSB8	0-3"	1050
Grassy	SOIL	RSB5	0-3"	985
Grassy	SOIL	RSB40	0-3"	901
Grassy	SOIL	RSB50	3-10"	888
Grassy	SOIL	RSB30	0-3"	887
Grassy	SOIL	RSB1	0-3"	873
Grassy	SOIL	RSB50	24-30"	873
Grassy	SOIL	RSB42	0-3"	834
Grassy	SOIL	BSB4	3-10"	690
Grassy	SOIL	RSB4	3-10"	686
Grassy	SOIL	RSB13	0-3"	682
Grassy	SOIL	RSB49	3-10"	663
Grassy	SOIL	RSB16	0-3"	661
Grassy	SOIL	RSB11	0-3"	641
Grassy	SOIL	RSB3	0-3"	632
Grassy	SOIL	RSB3	3-10"	593
Grassy	SOIL	RSB21	0-3"	497
Grassy	SOIL	RSB45	0-3"	487
Grassy	SOIL	RSB46	0-3"	385
Grassy	SOIL	RSB44	0-3"	369
Grassy	SOIL	RSB5	3-10"	366
Grassy	SOIL	RSB41	0-3"	341
Grassy	SOIL	RSB8	3-10"	321
Grassy	SOIL	RSB6	3-10"	289
Grassy	SOIL	RSB24	3-10"	288
Grassy	SOIL	BSB1	24-30"	262
Grassy	SOIL	BSB3	0-3"	257
Grassy	SOIL	RSB10	3-10"	241
Grassy	SOIL	RSB45	3-10"	234
Grassy	SOIL	RSB7	3-10"	232

Construction Worker 1	Lead (mg/kg)
PRG	4,600
RAL	43,300

Station	Pre-Remediation Conc. (mg/kg)	Post-Remediation Conc. (mg/kg)
Average	13,392	3,856
RSB2	1100	1100
BSB4	1060	1060
RSB49	1060	1060
RSB8	1050	1050
RSB5	985	985
RSB40	901	901
RSB50	888	888
RSB30	887	887
RSB1	873	873
RSB50	873	873
RSB42	834	834
BSB4	690	690
RSB4	686	686
RSB13	682	682
RSB49	663	663
RSB16	661	661
RSB11	641	641
RSB3	632	632
RSB3	593	593
RSB21	497	497
RSB45	487	487
RSB46	385	385
RSB44	369	369
RSB5	366	366
RSB41	341	341
RSB8	321	321
RSB6	289	289
RSB24	288	288
BSB1	262	262
BSB3	257	257
RSB10	241	241
RSB45	234	234
RSB7	232	232

Construction Worker 2	Lead (mg/kg)
PRG	920
RAL	4,954

Station	Pre-Remediation Conc. (mg/kg)	Post-Remediation Conc. (mg/kg)
Average	13,392	567
RSB2	1100	1100
BSB4	1060	1060
RSB49	1060	1060
RSB8	1050	1050
RSB5	985	985
RSB40	901	901
RSB50	888	888
RSB30	887	887
RSB1	873	873
RSB50	873	873
RSB42	834	834
BSB4	690	690
RSB4	686	686
RSB13	682	682
RSB49	663	663
RSB16	661	661
RSB11	641	641
RSB3	632	632
RSB3	593	593
RSB21	497	497
RSB45	487	487
RSB46	385	385
RSB44	369	369
RSB5	366	366
RSB41	341	341
RSB8	321	321
RSB6	289	289
RSB24	288	288
BSB1	262	262
BSB3	257	257
RSB10	241	241
RSB45	234	234
RSB7	232	232

Grassy Area All Depths (0 - 30")
Soil and Sediment combined

Exposure Area	MATRIX	Station	DEPTH	Lead (mg/kg)
Grassy	SOIL	RSB43	3-10"	230
Grassy	SOIL	RSB39	0-3"	227
Grassy	SOIL	RSB36	0-3"	216
Grassy	SOIL	RSB46	3-10"	216
Grassy	SOIL	RSB1	3-10"	215
Grassy	SOIL	RSB42	3-10"	214
Grassy	SOIL	RSB2	3-10"	202
Grassy	SOIL	RSB49	24-30"	186
Grassy	SOIL	RSB40	3-10"	161
Grassy	SOIL	BSB1	0-3"	158
Grassy	SOIL	RSB30	3-10"	127
Grassy	SOIL	RSB21	3-10"	105
Grassy	SOIL	RSB11	3-10"	101
Grassy	SOIL	RSB13	3-10"	96
Grassy	SOIL	RSB16	3-10"	95
Grassy	SOIL	RSB41	3-10"	82
Grassy	SOIL	RSB39	3-10"	81
Grassy	SOIL	BSB2	3-10"	74
Grassy	SOIL	BSB1	3-10"	63
Grassy	SOIL	RSB36	3-10"	55
Grassy	SOIL	RSB44	3-10"	53
Grassy	SOIL	RSB35	0-3"	43
Grassy	SOIL	RSB35	3-10"	23
Grassy	SOIL	BSB3	3-10"	20
Grassy	SOIL	RSB-70	24-30"	11

Construction Worker 1	Lead (mg/kg)
PRG	4,600
RAL	43,300

Average	13,392	3,856
Station	Pre-Remediation Conc. (mg/kg)	Post-Remediation Conc. (mg/kg)
RSB43	230	230
RSB39	227	227
RSB36	216	216
RSB46	216	216
RSB1	215	215
RSB42	214	214
RSB2	202	202
RSB49	186	186
RSB40	161	161
BSB1	158	158
RSB30	127	127
RSB21	105	105
RSB11	101	101
RSB13	96	96
RSB16	95	95
RSB41	82	82
RSB39	81	81
BSB2	74	74
BSB1	63	63
RSB36	55	55
RSB44	53	53
RSB35	43	43
RSB35	23	23
BSB3	20	20
RSB-70	11	11

Construction Worker 2	Lead (mg/kg)
PRG	920
RAL	4,954

Average	13,392	567
Station	Pre-Remediation Conc. (mg/kg)	Post-Remediation Conc. (mg/kg)
RSB43	230	230
RSB39	227	227
RSB36	216	216
RSB46	216	216
RSB1	215	215
RSB42	214	214
RSB2	202	202
RSB49	186	186
RSB40	161	161
BSB1	158	158
RSB30	127	127
RSB21	105	105
RSB11	101	101
RSB13	96	96
RSB16	95	95
RSB41	82	82
RSB39	81	81
BSB2	74	74
BSB1	63	63
RSB36	55	55
RSB44	53	53
RSB35	43	43
RSB35	23	23
BSB3	20	20
RSB-70	11	11

Grassy Area Surface (0 - 6")
Sediment only

Trespasser	Lead (ppm)
PRG	10,417
RAL	34,000

MATRIX	Station	DEPTH	Lead (mg/kg)
SED	RSED4	0-6"	243000
SED	RSED5	0-6"	228000
SED	RSED3	0-6"	95300
SED	RSED2	0-6"	73800
SED	RSED7	0-6"	46000
SED	RSED8	0-6"	34800
SED	RSED9	0-6"	32400
SED	RSED10	0-6"	29300
SED	RSED1	0-6"	19300

Average	89,100	9,033
Station	Pre-Remediation Conc. (mg/kg)	Post-Remediation Conc. (mg/kg)
RSED4	243000	50
RSED5	228000	50
RSED3	95300	50
RSED2	73800	50
RSED7	46000	50
RSED8	34800	50
RSED9	32400	32400
RSED10	29300	29300
RSED1	19300	19300

Arlington Ave
Sediment Data

MATRIX	Station	SAMPLE ID	DEPTH	Lead (mg/kg)
SED	R2SED-1	R2SED-1A	0-6"	1210
SED	R2SED-2	R2SED-2A	0-6"	1230
SED	R2SED-3	R2SED-3A	0-6"	1570
SED	R2SED-4	R2SED-4A	0-6"	2480
SED	R2SED-5	R2SED-5A	0-6"	5030
SED	R2SED-5	R2SED-5A	0-6"	5410
SED	R2SED-6	R2SED-6A	0-6"	8430
SED	R2SED-7	R2SED-7A	0-6"	5480
SED	R2SED-8	R2SED-8A	0-6"	8190
SED	R2SED-9	R2SED-9A	0-6"	3630
SED	R2SED-10	R2SED-10A	0-6"	84
SED	R2SED-11	R2SED-11-0-6	0-6"	874
SED	R2SED-12	R2SED-12-0-6	0-6"	411
SED	R2SED-13	R2SED-13-0-6	0-6"	771
SED	R2SED-14	R2SED-14-0-6	0-6"	681
			Average	3032

Big Four Road Lead Data

MATRIX	Station	SAMPLE ID	DEPTH	Lead (mg/kg)
SOIL	RSB65	RSB65A	0-3"	126
SOIL	RSB66	RSB66A	0-3"	222
SOIL	RSB67	RSB67A	0-3"	225
SOIL	RSB68	RSB68A	0-3"	201
SOIL	RSB65	RSB65B	3-10"	13
SOIL	RSB66	RSB66B	3-10"	106
SOIL	RSB67	RSB67B	3-10"	141
SOIL	RSB68	RSB68B	3-10"	128

Residential Lead Data

MATRIX	DEPTH	Station	SAMPLE ID	Date	Lead (mg/kg)	DUPLICATE
SOIL	0-3"	R2SB-32	R2SB-32A	08/27/01	286	
SOIL	0-3"	R2SB-33	R2SB-33C	08/27/01	250	FD of R2SB-33A
SOIL	0-3"	R2SB-33	R2SB-33A	08/27/01	202	
SOIL	0-3"	R2SB-34	R2SB-34A	08/27/01	170	
SOIL	0-3"	R2SB-35	R2SB-35A	08/27/01	191	
SOIL	0-3"	R2SB-36	R2SB-36C	08/27/01	328	FD of R2SB-36A
SOIL	0-3"	R2SB-36	R2SB-36A	08/27/01	310	
SOIL	0-3"	R2SB-40	R2SB-40A	08/27/01	422	
SOIL	0-3"	R2SB-41	R2SB-41A	08/27/01	172	
SOIL	0-3"	R2SB-42	R2SB-42A	08/27/01	165	
SOIL	3-10"	R2SB-32	R2SB-32B	08/27/01	91	
SOIL	3-10"	R2SB-33	R2SB-33B	08/27/01	67	
SOIL	3-10"	R2SB-34	R2SB-34B	08/27/01	28	
SOIL	3-10"	R2SB-35	R2SB-35B	08/27/01	79	
SOIL	3-10"	R2SB-36	R2SB-36B	08/27/01	109	
SOIL	3-10"	R2SB-40	R2SB-40B	08/27/01	50	
SOIL	3-10"	R2SB-41	R2SB-41B	08/27/01	128	
SOIL	3-10"	R2SB-42	R2SB-42B	08/27/01	77	

Appendix C
Arsenic Data Sets
and
EPC Calculations

Exide Beech Grove
Exposure Point Concentrations

Exposure Area	Receptor	Media	Depth	Arsenic 95% UCL		Lead Mean
				mg/kg	Basis	mg/kg
Onsite	Construction Worker 1 & 2, Utility Worker	Soil	0-5 ft	123	NP, Bootstrap	20,266
Grassy Area	Trespasser	Soil	0-6 in	60	NP, Chebyshev 95% UCL	1,908
	Trespasser	Sediment	0-6 in	1,387	Gamma UCL	89,100
	Groundskeeper, Worker	Soil and Sediment	0-6 in	779	NP, Chebyshev 99% UCL	20,158
	Construction Worker 1 & 2	Soil and Sediment	0-30 in	818	NP, Chebyshev 99% UCL	13,392
Offsite Gas Facility	Worker	Soil	0-6 in	28.5	LN, H-UCL	1,311
Arlington Ave	Recreator	Sediment	0-3 in	38	NP, Chebyshev 95% UCL	3,032
Railroad Ditch	Recreator	Sediment	0-3 in	169	Max	5,150

Notes:
NP Nonparametric
LN Lognormal

Onsite Soil (0-5 ft)
Individual Sample Data

Station	SAMPLE ID	Year	DEPTH	As Conc (mg/kg)
RSED6	RSED6A	1999	0-6"	305
RSED6	RSED6B	1999	6-12"	114
CSB30	CSB-30A-C	2001	12-15"	9.1
CSB3	CSB3B	1999	6-9"	565
CSB3	CSB3C	1999	12-15"	217
CSB3	CSB3D	1999	24-28"	193
CSB3	CSB3E	1999	36-39"	12
CSB30	CSB-30A-E	2001	36-39"	6.6
CSB30	CSB30B	1999	6-9"	6.7
CSB30	CSB30A	1999	0-3"	9.5
CSB3	CSB3A	1999	0-3"	284
CSB30	CSB-30A-D	2001	24-27"	6.6
CSB29	CSB29C	1999	12-15"	11
CSB30	CSB-30A-B	2001	6-9"	13
CSB30	CSB-30A-A	2001	0-3"	30
CSB31	CSB31A	1999	0-3"	14
CSB31	CSB31C	1999	12-15"	6.7
CSB31	CSB31B	1999	6-9"	22
CSB32	CSB-32A-B	2001	6-9"	199
CSB30	CSB30C	1999	12-15"	11
CSB28	CSB28A	1999	0-3"	4.4
CSB-26	CSB-26A-E	2001	36-39"	5.8
CSB-26	CSB-26A-D	2001	24-27"	6.2
CSB-26	CSB-26A-C	2001	12-15"	6.4
CSB-26	CSB-26A-A	2001	0-3"	12
CSB27	CSB27C	1999	12-15"	6.4
CSB27	CSB27B	1999	6-9"	8.5
CSB27	CSB27A	1999	0-3"	6.3
CSB29	CSB29A	1999	0-3"	9.2
CSB28	CSB28C	1999	12-15"	23
CSB1	CSB1A	1999	0-3"	406
CSB28	CSB-28A-D	2001	24-27"	6.5
CSB28	CSB-28A-B	2001	6-9"	5.1
CSB28	CSB-28A-A	2001	0-3"	53
CSB28	CSB28B	1999	6-9"	10
CSB28	CSB-28A-E	2001	36-39"	9.4
CSB32	CSB-32A-D	2001	24-27"	8
CSB29	CSB29B	1999	6-9"	25
CSB28	CSB-28A-C	2001	12-15"	7.9
CSB37	CSB37B	1999	6-9"	7.9
CSB35	CSB-35A-D	2001	24-27"	6
CSB35	CSB-35A-C	2001	12-15"	408
CSB35	CSB-35A-B	2001	6-9"	6.1
CSB35	CSB-35A-A	2001	0-3"	154
CSB36	CSB36A	1999	0-3"	170
CSB36	CSB36C	1999	12-15"	12
CSB32	CSB-32A-E	2001	36-39"	6.5
CSB37	CSB37A	1999	0-3"	30
CSB35	CSB35A	1999	0-3"	8.4
CSB37	CSB37C	1999	12-15"	6.8
CSB38	CSB-38A-E	2001	36-39"	8.6
CSB38	CSB-38A-A	2001	0-3"	67
CSB38	CSB-38A-B	2001	6-9"	7.9
CSB38	CSB-38A-C	2001	12-15"	9.3
CSB38	CSB-38A-D	2001	24-27"	2.5
CSB38	CSB38B	1999	6-9"	4.4
CSB36	CSB36B	1999	6-9"	15
CSB34	CSB34C	1999	12-15"	7

Onsite Soil (0-5 ft)
Data Averaged by Location

Station	Year	Num Samples	As Avg Conc (mg/kg)
RSB71	1999	1	215.0
RSB22	1999	2	15.5
RSB37	1999	2	15.0
RSB33	1999	2	33.0
RSB31	1999	2	217.0
RSB29	1999	2	17.0
RSB28	1999	2	36.0
RSB27	1999	2	7.3
RSB26	1999	2	179.5
RSB38	1999	2	10.6
RSB23	1999	2	10.3
RSB34	1999	2	6.4
RSB20	1999	2	12.0
RSB19	1999	2	6.9
RSB18	1999	2	7.1
RSB17	1999	2	9.9
RSB15	1999	2	16.0
RSB14	1999	2	19.5
RSB12	1999	2	110.0
RSED6	1999	2	209.5
RSB25	1999	2	485.5
RSB32	1999	2	10.4
CSB33	1999	3	12.7
CSB15	1999	3	6.7
CSB14	1999	3	4.8
CSB13	1999	3	19.7
CSB12	1999	3	1111.3
CSB17	1999	3	7.1
CSB32	1999	3	134.1
CSB18	1999	3	7.4
CSB34	1999	3	68.4
CSB11	1999	3	278.7
CSB36	1999	3	65.7
CSB37	1999	3	14.9
CSB38	1999	3	5.7
CSB39	1999	3	292.3
CSB31	1999	3	14.2
CSB24	1999	3	6.2
CSB30	1999	3	9.1
CSB28	1999	3	12.5
CSB27	1999	3	7.1
CSB50	1999	3	12.7
CSB26	1999	3	7.6
CSB16	1999	3	6.9
CSB25	1999	3	32.3
CSB29	1999	3	15.1
CSB23	1999	3	6.9
CSB22	1999	3	6.5
CSB21	1999	3	8.0
CSB20	1999	3	6.3
CSB2	1999	3	298.0
CSB19	1999	3	7.5
CSB4	1999	3	286.9
RSB78	1999	3	13.0
CSB40	1999	3	18.8
RSB57	1999	3	126.0
RSB58	1999	3	161.3
RSB72	1999	3	8.0

Onsite Soil (0-5 ft)
Individual Sample Data

Station	SAMPLE ID	Year	DEPTH	As Conc (mg/kg)
CSB26	CSB26A	1999	0-3"	7.7
CSB32	CSB-32A-C	2001	12-15"	230
CSB32	CSB32B	1999	6-9"	7.4
CSB32	CSB32A	1999	0-3"	388
CSB32	CSB32C	1999	12-15"	7
CSB33	CSB33C	1999	12-15"	13
CSB33	CSB33B	1999	6-9"	12
CSB35	CSB-35A-E	2001	36-39"	6.3
CSB34	CSB34B	1999	6-9"	9.1
CSB35	CSB-35A-F	2001	48-51"	6.3
CSB34	CSB34A	1999	0-3"	189
CSB35	CSB35E	1999	36-39"	15
CSB35	CSB35D	1999	24-28"	12
CSB35	CSB35F	1999	48-51"	12
CSB35	CSB35C	1999	12-15"	7
CSB35	CSB35B	1999	6-9"	9.5
CSB32	CSB-32A-A	2001	0-3"	394
CSB33	CSB33A	1999	0-3"	13
CSB13	CSB-13A-E	2001	36-39"	6
CSB11	CSB11A	1999	0-3"	237
CSB11	CSB11C	1999	12-15"	14
CSB12	CSB12C	1999	12-15"	14
CSB12	CSB12B	1999	6-9"	2270
CSB12	CSB12A	1999	0-3"	1050
CSB13	CSB-13A-B	2001	6-9"	22
CSB-26	CSB-26A-B	2001	6-9"	11
CSB13	CSB-13A-C	2001	12-15"	6.6
CSB-10	CSB-10A-F	2001	48-51"	1700
CSB13	CSB-13A-D	2001	24-27"	5.9
CSB13	CSB13A	1999	0-3"	38
CSB13	CSB13B	1999	6-9"	11
CSB13	CSB13C	1999	12-15"	10
CSB14	CSB14A	1999	0-3"	2.2
CSB14	CSB14C	1999	12-15"	6.4
CSB14	CSB14B	1999	6-9"	5.7
CSB13	CSB-13A-A	2001	0-3"	11
CSB-10	CSB10A	1999	0-3"	709
CSB1	CSB1B	1999	6-9"	599
CSB1	CSB1C	1999	12-15"	8
CSB1	CSB-1A-F	2001	48-51"	8.5
CSB1	CSB-1A-B	2001	6-9"	1.5
CSB1	CSB-1A-C	2001	12-15"	1.5
CSB1	CSB-1A-A	2001	0-3"	3.2
CSB1	CSB-1A-D	2001	24-27"	989
CSB11	CSB11B	1999	6-9"	585
CSB-10	CSB-10A-C	2001	12-15"	433
CSB-10	CSB-10A-A	2001	0-3"	4.5
CSB-10	CSB10B	1999	6-9"	916
CSB-10	CSB10C	1999	12-15"	17
CSB-10	CSB-10A-B	2001	6-9"	6.1
CSB-10	CSB-10A-E	2001	36-39"	7.1
CSB-10	CSB-10A-D	2001	24-27"	2730
CSB-10	CSB10D	1999	12-15"	6.9
CSB15	CSB15B	1999	6-9"	7.8
CSB1	CSB-1A-E	2001	36-39"	6.8
CSB24	CSB24A	1999	0-3"	4.8
CSB15	CSB15C	1999	12-15"	5.3
CSB21	CSB21B	1999	6-9"	9.3

Onsite Soil (0-5 ft)
Data Averaged by Location

Station	Year	Num Samples	As Avg Conc (mg/kg)
RSB73	1999	3	12.2
RSB74	1999	3	9.0
RSB75	1999	3	28.3
RSB55	1999	3	247.3
RSB77	1999	3	7.1
RSB56	1999	3	7.5
RSB79	1999	3	7.8
RSB80	1999	3	7.0
RSB81	1999	3	8.6
RSB82	1999	3	13.9
RSB83	1999	3	11.1
RSB84	1999	3	10.2
RSB85	1999	3	6.9
RSB76	1999	3	13.9
RSB54	1999	3	68.1
CSB42	1999	3	34.6
RSB53	1999	3	7.8
RSB52	1999	3	6.5
CSB49	1999	3	7.1
CSB9	1999	3	10.2
CSB8	1999	3	28.7
CSB6	1999	3	9.8
CSB1	1999	3	337.7
CSB41	1999	3	6.2
CSB5	1999	3	6.5
CSB-10	1999	4	412.2
CSB38	2001	5	19.1
CSB13	2001	5	10.3
CSB-26	2001	5	8.3
CSB32	2001	5	167.5
CSB30	2001	5	13.1
CSB3	1999	5	254.2
CSB28	2001	5	16.4
CSB7	1999	5	245.0
CSB1	2001	6	168.4
CSB-10	2001	6	813.5
CSB35	1999	6	10.7
CSB51	1999	6	91.5
CSB35	2001	6	97.8

Onsite Soil (0-5 ft)
Individual Sample Data

Station	SAMPLE ID	Year	DEPTH	As Conc (mg/kg)
CSB21	CSB21A	1999	0-3"	7.8
CSB22	CSB22B	1999	6-9"	6.7
CSB22	CSB22A	1999	0-3"	6.3
CSB22	CSB22C	1999	12-15"	6.6
CSB23	CSB23A	1999	0-3"	7.5
CSB20	CSB20A	1999	0-3"	9.6
CSB23	CSB23C	1999	12-15"	6.2
CSB20	CSB20B	1999	6-9"	6.9
CSB24	CSB24B	1999	6-9"	9.3
CSB24	CSB24C	1999	12-15"	4.4
CSB25	CSB25B	1999	6-9"	75
CSB25	CSB25C	1999	12-15"	8.8
CSB25	CSB25A	1999	0-3"	13
CSB26	CSB26B	1999	6-9"	6.5
CSB39	CSB39A	1999	0-3"	863
CSB23	CSB23B	1999	6-9"	7
CSB18	CSB18C	1999	12-15"	8.3
CSB26	CSB26C	1999	12-15"	8.6
CSB16	CSB16C	1999	12-15"	7.5
CSB16	CSB16A	1999	0-3"	6
CSB16	CSB16B	1999	6-9"	7.2
CSB17	CSB17A	1999	0-3"	7.3
CSB17	CSB17B	1999	6-9"	7.1
CSB17	CSB17C	1999	12-15"	6.9
CSB21	CSB21C	1999	12-15"	6.8
CSB18	CSB18A	1999	0-3"	7.8
CSB15	CSB15A	1999	0-3"	7
CSB19	CSB19A	1999	0-3"	9
CSB19	CSB19C	1999	12-15"	6.7
CSB19	CSB19B	1999	6-9"	6.8
CSB2	CSB2B	1999	6-9"	159
CSB2	CSB2C	1999	12-15"	469
CSB2	CSB2A	1999	0-3"	266
CSB20	CSB20C	1999	12-15"	2.4
CSB18	CSB18B	1999	6-9"	6
RSB58	RSB58A	1999	0-3"	247
RSB55	RSB55B	1999	3-10"	359
RSB56	RSB56B	1999	3-10"	7.7
RSB56	RSB56C	1999	24-30"	6.1
RSB56	RSB56A	1999	0-3"	8.6
RSB57	RSB57C	1999	24-30"	16
RSB57	RSB57B	1999	3-10"	127
RSB73	RSB73C	1999	24-30"	7.6
RSB58	RSB58C	1999	24-30"	37
RSB54	RSB54A	1999	0-3"	107
RSB58	RSB58B	1999	3-10"	200
RSB71	RSB71A	1999	0-3"	215
RSB72	RSB72A	1999	0-3"	8.7
RSB72	RSB72B	1999	3-10"	7
RSB72	RSB72C	1999	24-30"	8.2
RSB73	RSB73A	1999	0-3"	18
CSB38	CSB38A	1999	0-3"	4.9
RSB57	RSB57A	1999	0-3"	235
RSB52	RSB52A	1999	0-3"	6.6
RSB33	RSB33A	1999	0-3"	56
RSB33	RSB33B	1999	3-10"	10
RSB34	RSB34A	1999	0-3"	6.5
RSB34	RSB34B	1999	3-10"	6.3

Onsite Soil (0-5 ft)
Data Averaged by Location

Station	Year	Num Samples	As Avg Conc (mg/kg)

Onsite Soil (0-5 ft)
Individual Sample Data

Station	SAMPLE ID	Year	DEPTH	As Conc (mg/kg)
RSB37	RSB37B	1999	3-10"	13
RSB37	RSB37A	1999	0-3"	17
RSB38	RSB38A	1999	0-3"	14
RSB55	RSB55A	1999	0-3"	323
RSB52	RSB52C	1999	24-30"	6.9
RSB55	RSB55C	1999	24-30"	60
RSB52	RSB52B	1999	3-10"	5.9
RSB53	RSB53B	1999	3-10"	8.3
RSB53	RSB53C	1999	24-30"	6.9
RSB53	RSB53A	1999	0-3"	8.2
RSB54	RSB54C	1999	24-30"	3.4
RSB54	RSB54B	1999	3-10"	94
RSB74	RSB74A	1999	0-3"	13
RSB38	RSB38B	1999	3-10"	7.2
RSB83	RSB83C	1999	24-30"	16
RSB80	RSB80A	1999	0-3"	7.4
RSB81	RSB81A	1999	0-3"	9.4
RSB81	RSB81B	1999	3-10"	9.3
RSB81	RSB81C	1999	24-30"	7
RSB82	RSB82C	1999	24-30"	9.3
RSB82	RSB82B	1999	3-10"	24
RSB73	RSB73B	1999	3-10"	11
RSB83	RSB83B	1999	3-10"	7.4
RSB79	RSB79A	1999	0-3"	8.5
RSB83	RSB83A	1999	0-3"	9.9
RSB84	RSB84C	1999	24-30"	5.7
RSB84	RSB84A	1999	0-3"	10
RSB84	RSB84B	1999	3-10"	15
RSB85	RSB85B	1999	3-10"	6.7
RSB85	RSB85C	1999	24-30"	7
RSB85	RSB85A	1999	0-3"	7.1
RSB82	RSB82A	1999	0-3"	8.5
RSB77	RSB77A	1999	0-3"	7
RSB74	RSB74C	1999	24-30"	4.9
RSB74	RSB74B	1999	3-10"	9
RSB75	RSB75C	1999	24-30"	12
RSB75	RSB75B	1999	3-10"	15
RSB75	RSB75A	1999	0-3"	58
RSB76	RSB76B	1999	3-10"	10
RSB76	RSB76A	1999	0-3"	24
RSB80	RSB80B	1999	3-10"	7
RSB77	RSB77B	1999	3-10"	7.7
RSB80	RSB80C	1999	24-30"	6.7
RSB77	RSB77C	1999	24-30"	6.6
RSB78	RSB78A	1999	0-3"	14
RSB78	RSB78B	1999	3-10"	12
RSB78	RSB78C	1999	24-30"	13
RSB79	RSB79B	1999	3-10"	6.9
RSB79	RSB79C	1999	24-30"	8.1
RSB31	RSB31A	1999	0-3"	202
RSB76	RSB76C	1999	24-30"	7.7
CSB51	CSB51B	1999	6-9"	187
CSB5	CSB5A	1999	0-3"	7.2
CSB50	CSB50C	1999	12-15"	10
CSB50	CSB50A	1999	0-3"	15
CSB50	CSB50B	1999	6-9"	13
CSB51	CSB51F	1999	48-51"	18
CSB51	CSB51E	1999	36-39"	26

Onsite Soil (0-5 ft)
Data Averaged by Location

Station	Year	Num Samples	As Avg Conc (mg/kg)

Onsite Soil (0-5 ft)
Individual Sample Data

Station	SAMPLE ID	Year	DEPTH	As Conc (mg/kg)
RSB32	RSB32B	1999	3-10"	7.7
CSB51	CSB51A	1999	0-3"	265
CSB49	CSB49C	1999	12-15"	6.8
CSB51	CSB51C	1999	12-15"	17
CSB6	CSB6A	1999	0-3"	8.9
CSB6	CSB6C	1999	12-15"	11
CSB6	CSB6B	1999	6-9"	9.6
CSB7	CSB7B	1999	6-9"	788
CSB7	CSB7C	1999	12-15"	343
CSB7	CSB7A	1999	0-3"	81
CSB51	CSB51D	1999	24-28"	36
CSB41	CSB41A	1999	0-3"	4.8
CSB39	CSB39B	1999	6-9"	8
CSB39	CSB39C	1999	12-15"	5.8
CSB4	CSB4A	1999	0-3"	690
CSB4	CSB4B	1999	6-9"	164
CSB4	CSB4C	1999	12-15"	6.8
CSB40	CSB40C	1999	12-15"	11
CSB40	CSB40B	1999	6-9"	6.4
CSB5	CSB5B	1999	6-9"	7.1
CSB41	CSB41B	1999	6-9"	7.6
CSB5	CSB5C	1999	12-15"	5.1
CSB41	CSB41C	1999	12-15"	6.3
CSB42	CSB42B	1999	6-9"	73
CSB42	CSB42C	1999	12-15"	7.8
CSB42	CSB42A	1999	0-3"	23
CSB49	CSB49B	1999	6-9"	6.4
CSB49	CSB49A	1999	0-3"	8.1
CSB8	CSB8C	1999	12-15"	10
CSB40	CSB40A	1999	0-3"	39
RSB27	RSB27B	1999	3-10"	6.5
CSB7	CSB7E	1999	36-39"	6.2
RSB22	RSB22B	1999	3-10"	10
RSB22	RSB22A	1999	0-3"	21
RSB23	RSB23A	1999	0-3"	18
RSB23	RSB23B	1999	3-10"	2.6
RSB25	RSB25B	1999	3-10"	104
RSB25	RSB25A	1999	0-3"	867
RSB20	RSB20A	1999	0-3"	14
RSB26	RSB26A	1999	0-3"	175
RSB19	RSB19B	1999	3-10"	6.8
RSB27	RSB27A	1999	0-3"	8.1
RSB28	RSB28B	1999	3-10"	16
RSB28	RSB28A	1999	0-3"	56
RSB29	RSB29A	1999	0-3"	23
RSB29	RSB29B	1999	3-10"	11
RSB31	RSB31B	1999	3-10"	232
CSB38	CSB38C	1999	12-15"	7.8
RSB26	RSB26B	1999	3-10"	184
RSB14	RSB14A	1999	0-3"	24
RSB32	RSB32A	1999	0-3"	13
CSB8	CSB8A	1999	0-3"	66
CSB8	CSB8B	1999	6-9"	10
CSB9	CSB9A	1999	0-3"	12
CSB9	CSB9B	1999	6-9"	11
CSB9	CSB9C	1999	12-15"	7.7
RSB12	RSB12B	1999	3-10"	125
RSB20	RSB20B	1999	3-10"	10

Onsite Soil (0-5 ft)
Data Averaged by Location

Station	Year	Num Samples	As Avg Conc (mg/kg)

Onsite Soil (0-5 ft)
Individual Sample Data

Station	SAMPLE ID	Year	DEPTH	As Conc (mg/kg)
RSB14	RSB14B	1999	3-10"	15
CSB7	CSB7D	1999	24-28"	6.9
RSB15	RSB15A	1999	0-3"	22
RSB15	RSB15B	1999	3-10"	10
RSB17	RSB17B	1999	3-10"	9.7
RSB17	RSB17A	1999	0-3"	10
RSB18	RSB18B	1999	3-10"	6.3
RSB18	RSB18A	1999	0-3"	7.8
RSB19	RSB19A	1999	0-3"	7
RSB12	RSB12A	1999	0-3"	95

Onsite Soil (0-5 ft)
Data Averaged by Location

Station	Year	Num Samples	As Avg Conc (mg/kg)

Offsite Gas Facility
Arsenic Data

Matrix	Station	DEPTH	Arsenic (mg/kg)
SOIL	R2SB-12	0-3"	11
SOIL	R2SB-19	0-3"	16
SOIL	R2SB-18	0-3"	10
SOIL	R2SB-17	0-3"	25
SOIL	R2SB-16	0-3"	7.7
SOIL	R2SB-15	0-3"	4.8
SOIL	R2SB-14	0-3"	8.6
SOIL	R2BG-1	0-3"	9.8
SOIL	R2SB-13	0-3"	53
SOIL	R2SB-20	0-3"	9.6
SOIL	R2SB-11	0-3"	14
SOIL	R2SB-10	0-3"	8.9
SOIL	R2SB-1	0-3"	58
SOIL	R2SB-1	0-3"	141
SOIL	R2BG-4	0-3"	3.1
SOIL	R2BG-3	0-3"	6
SOIL	R2BG-2	0-3"	10
SOIL	R2SB-13	0-3"	14
SOIL	R2SB-4	0-3"	26
SOIL	RSB-64	0-3"	32
SOIL	RSB-63	0-3"	16
SOIL	R2SB-9	0-3"	47
SOIL	R2SB-8	0-3"	13
SOIL	R2SB-7	0-3"	9.6
SOIL	R2SB-6	0-3"	12
SOIL	R2SB-52	0-3"	4.6
SOIL	R2SB-2	0-3"	19
SOIL	R2SB-4	0-3"	28
SOIL	R2SB-2	0-3"	16
SOIL	R2SB-3	0-3"	38
SOIL	R2SB-3	0-3"	36
SOIL	R2SB-24	0-3"	13
SOIL	R2SB-23	0-3"	10
SOIL	R2SB-22	0-3"	13
SOIL	R2SB-21	0-3"	10
SOIL	RSB-69	0-3"	55
SOIL	R2SB-5	0-3"	10

Grassy Area Surface Soil and Sediment (0-6")

MATRIX	DEPTH	Station	PARAMETER	As Conc. (mg/kg)
SOIL	0-3"	BSB1	Arsenic	5.5
SOIL	0-3"	BSB2	Arsenic	13
SOIL	0-3"	BSB3	Arsenic	7
SOIL	0-3"	BSB4	Arsenic	16
SOIL	0-3"	RSB1	Arsenic	11
SOIL	0-3"	RSB10	Arsenic	14
SOIL	0-3"	RSB11	Arsenic	13
SOIL	0-3"	RSB13	Arsenic	11
SOIL	0-3"	RSB16	Arsenic	13
SOIL	0-3"	RSB2	Arsenic	14
SOIL	0-3"	RSB21	Arsenic	8.3
SOIL	0-3"	RSB24	Arsenic	20
SOIL	0-3"	RSB3	Arsenic	9.1
SOIL	0-3"	RSB30	Arsenic	15
SOIL	0-3"	RSB35	Arsenic	10
SOIL	0-3"	RSB36	Arsenic	9.2
SOIL	0-3"	RSB39	Arsenic	10
SOIL	0-3"	RSB4	Arsenic	22
SOIL	0-3"	RSB40	Arsenic	19
SOIL	0-3"	RSB41	Arsenic	10
SOIL	0-3"	RSB42	Arsenic	15
SOIL	0-3"	RSB43	Arsenic	20
SOIL	0-3"	RSB44	Arsenic	9.5
SOIL	0-3"	RSB45	Arsenic	6.1
SOIL	0-3"	RSB46	Arsenic	3.9
SOIL	0-3"	RSB49	Arsenic	20
SOIL	0-3"	RSB5	Arsenic	10
SOIL	0-3"	RSB50	Arsenic	38
SOIL	0-3"	RSB51	Arsenic	169
SOIL	0-3"	RSB6	Arsenic	22
SOIL	0-3"	RSB7	Arsenic	14
SOIL	0-3"	RSB-70	Arsenic	212
SOIL	0-3"	RSB8	Arsenic	23
SOIL	0-3"	RSB9	Arsenic	96
SED	0-6"	RSED1	Arsenic	310
SED	0-6"	RSED10	Arsenic	96
SED	0-6"	RSED2	Arsenic	713
SED	0-6"	RSED3	Arsenic	740
SED	0-6"	RSED4	Arsenic	2300
SED	0-6"	RSED5	Arsenic	1230
SED	0-6"	RSED7	Arsenic	170
SED	0-6"	RSED8	Arsenic	159
SED	0-6"	RSED9	Arsenic	124

Grassy Area Soil (0-30")

MATRIX	Station	Avg As Conc (mg/kg)	N
SOIL	BSB1	7.13	3
SOIL	BSB2	9.05	2
SOIL	BSB3	6.20	2
SOIL	BSB4	14.00	2
SOIL	RSB1	8.60	2
SOIL	RSB10	10.30	2
SOIL	RSB11	9.05	2
SOIL	RSB13	8.00	2
SOIL	RSB16	9.30	2
SOIL	RSB2	10.30	2
SOIL	RSB21	7.75	2
SOIL	RSB24	13.25	2
SOIL	RSB3	8.05	2
SOIL	RSB30	11.20	2
SOIL	RSB35	8.20	2
SOIL	RSB36	7.45	2
SOIL	RSB39	8.80	2
SOIL	RSB4	15.90	2
SOIL	RSB40	13.00	2
SOIL	RSB41	7.85	2
SOIL	RSB42	11.15	2
SOIL	RSB43	15.50	2
SOIL	RSB44	9.20	2
SOIL	RSB45	8.05	2
SOIL	RSB46	4.65	2
SOIL	RSB49	10.70	2
SOIL	RSB5	8.75	2
SOIL	RSB50	19.67	3
SOIL	RSB51	96.33	3
SOIL	RSB6	15.50	2
SOIL	RSB7	10.40	2
SOIL	RSB-70	180.17	3
SOIL	RSB8	16.05	2
SOIL	RSB9	61.50	2
SED	RSED1	286.50	2
SED	RSED10	78.50	2
SED	RSED2	471.00	2
SED	RSED3	462.00	2
SED	RSED4	1415.50	2
SED	RSED5	2555.00	2
SED	RSED7	124.00	2
SED	RSED8	131.00	2
SED	RSED9	87.00	2

Grassy Area Surface Soil (0-6")

MATRIX	DEPTH	Station	As Conc. (mg/kg)
SOIL	0-3"	BSB1	5.5
SOIL	0-3"	BSB2	13
SOIL	0-3"	BSB3	7
SOIL	0-3"	BSB4	16
SOIL	0-3"	RSB1	11
SOIL	0-3"	RSB10	14
SOIL	0-3"	RSB11	13
SOIL	0-3"	RSB13	11
SOIL	0-3"	RSB16	13
SOIL	0-3"	RSB2	14
SOIL	0-3"	RSB21	8.3
SOIL	0-3"	RSB24	20
SOIL	0-3"	RSB3	9.1
SOIL	0-3"	RSB30	15
SOIL	0-3"	RSB35	10
SOIL	0-3"	RSB36	9.2
SOIL	0-3"	RSB39	10
SOIL	0-3"	RSB4	22
SOIL	0-3"	RSB40	19
SOIL	0-3"	RSB41	10
SOIL	0-3"	RSB42	15
SOIL	0-3"	RSB43	20
SOIL	0-3"	RSB44	9.5
SOIL	0-3"	RSB45	6.1
SOIL	0-3"	RSB46	3.9
SOIL	0-3"	RSB49	20
SOIL	0-3"	RSB5	10
SOIL	0-3"	RSB50	38
SOIL	0-3"	RSB51	169
SOIL	0-3"	RSB6	22
SOIL	0-3"	RSB7	14
SOIL	0-3"	RSB-70	212
SOIL	0-3"	RSB8	23
SOIL	0-3"	RSB9	96

Grassy Area Sediment

MATRIX	DEPTH	Station	As Conc. (mg/kg)
SED	0-6"	RSED1	310
SED	0-6"	RSED10	96
SED	0-6"	RSED2	713
SED	0-6"	RSED3	740
SED	0-6"	RSED4	2300
SED	0-6"	RSED5	1230
SED	0-6"	RSED7	170
SED	0-6"	RSED8	159
SED	0-6"	RSED9	124

Arlington Ave Sediment

MATRIX	Station	DEPTH	As Conc. (mg/kg)
SED	R2SED-1	0-6"	10
SED	R2SED-10	0-6"	9.4
SED	R2SED-11	0-6"	12
SED	R2SED-12	0-6"	11
SED	R2SED-13	0-6"	12
SED	R2SED-14	0-6"	11
SED	R2SED-2	0-6"	10
SED	R2SED-3	0-6"	12
SED	R2SED-4	0-6"	20
SED	R2SED-5	0-6"	46
SED	R2SED-6	0-6"	44
SED	R2SED-7	0-6"	39
SED	R2SED-8	0-6"	36
SED	R2SED-9	0-6"	29

Railroad Ditch Sediment

MATRIX	Station	DEPTH	As Conc. (mg/kg)
SED	R2SB25	0-3"	23
SED	R2SB26	0-3"	169
SED	R2SB27	0-3"	25
SED	R2SB28	0-3"	23
SED	R2SB29	0-3"	154
SED	R2SB30	0-3"	12

Onsite Main Facility Area Soil (0 - 5 ft)

Summary Statistics for	Site- avg
Number of Samples	97
Minimum	4.8
Maximum	1111.3
Mean	82.4
Median	13.0
Standard Deviation	165.2
Variance	27306.7
Coefficient of Variation	2.0
Skewness	3.8

95 % UCL (Assuming Normal Data)	
Student's-t	110.3

95 % UCL (Adjusted for Skewness)	
Adjusted-CLT	117.0
Modified-t	111.3

95 % Non-parametric UCL	
CLT	110.0
Jackknife	110.3
Standard Bootstrap	110.1
Bootstrap-t	123.2
Chebyshev (Mean, Std)	155.5

Summary Statistics for	ln(Site- avg)
Minimum	1.6
Maximum	7.0
Mean	3.2
Standard Deviation	1.4
Variance	2.1

Lilliefors Test Statisitic	0.2
Lilliefors 5% Critical Value	0.1

Data not Lognormal at 5% Significance Level
Data not Normal: Try Non-parametric UCL

Estimates Assuming Lognormal Distribution	
MLE Mean	68.6
MLE Standard Deviation	181.4
MLE Coefficient of Variation	2.6
MLE Skewness	26.5
MLE Median	24.2
MLE 80% Quantile	82.0
MLE 90% Quantile	154.6
MLE 95% Quantile	259.8
MLE 99% Quantile	693.7

MVU Estimate of Median	24.0
MVU Estimate of Mean	67.1
MVU Estimate of Std. Dev.	162.7
MVU Estimate of SE of Mean	13.4

UCL Assuming Lognormal Distribution	
95% H-UCL	101.4
95% Chebyshev (MVUE) UCL	125.5
99% Chebyshev (MVUE) UCL	200.3

Note: Data are averaged by boring location first, before being run in the ProUCL program.

Grassy Area UCL Calculations

Data File | Variable: Groundskeeper/Worker

Raw Statistics	
Number of Valid Samples	43
Number of Unique Samples	30
Minimum	3.9
Maximum	2300
Mean	157.0
Median	15.0
Standard Deviation	410.1
Variance	168192.5
Coefficient of Variation	2.6
Skewness	4.1

Gamma Statistics	
k hat	0.4
k star (bias corrected)	0.4
Theta hat	392.3
Theta star	404.8
nu hat	34.4
nu star	33.3
Approx.Chi Square Value (.05)	21.1
Adjusted Level of Significance	0.0
Adjusted Chi Square Value	20.8

Log-transformed Statistics	
Minimum of log data	1.4
Maximum of log data	7.7
Mean of log data	3.4
Standard Deviation of log data	1.6
Variance of log data	2.5

RECOMMENDATION
Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.4
Shapiro-Wilk 5% Critical Value	0.9
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	262.2

Gamma Distribution Test	
A-D Test Statistic	5.3
A-D 5% Critical Value	0.8
K-S Test Statistic	0.3
K-S 5% Critical Value	0.1
Data do not follow gamma distribution at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	247.6
Adjusted Gamma UCL	251.7

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.8
Shapiro-Wilk 5% Critical Value	0.9
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	228.7
95% Chebyshev (MVUE) UCL	243.5
97.5% Chebyshev (MVUE) UCL	305.1
99% Chebyshev (MVUE) UCL	426.2

95% Non-parametric UCLs	
CLT UCL	259.9
Adj-CLT UCL (Adjusted for skewness)	301.8
Mod-t UCL (Adjusted for skewness)	268.7
Jackknife UCL	262.2
Standard Bootstrap UCL	258.1
Bootstrap-t UCL	377.9
Hall's Bootstrap UCL	598.5
Percentile Bootstrap UCL	266.8
BCA Bootstrap UCL	315.5
95% Chebyshev (Mean, Sd) UCL	429.6
97.5% Chebyshev (Mean, Sd) UCL	547.6
99% Chebyshev (Mean, Sd) UCL	**779.3**

Data File

Variable: **Const Worker 1& 2**

Raw Statistics	
Number of Valid Samples	43
Number of Unique Samples	39
Minimum	4.65
Maximum	2555
Mean	145.8
Median	11.15
Standard Deviation	442.7
Variance	195948.8
Coefficient of Variation	3.0
Skewness	4.6

Gamma Statistics	
k hat	0.4
k star (bias corrected)	0.4
Theta hat	395.1
Theta star	406.4
nu hat	31.7
nu star	30.9
Approx.Chi Square Value (.05)	19.2
Adjusted Level of Significance	0.0
Adjusted Chi Square Value	18.9

Log-transformed Statistics	
Minimum of log data	1.5
Maximum of log data	7.8
Mean of log data	3.2
Standard Deviation of log data	1.6
Variance of log data	2.5

RECOMMENDATION

Data are Non-parametric (0.05)

Use 99% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.4
Shapiro-Wilk 5% Critical Value	0.9
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	259.4
Gamma Distribution Test	
A-D Test Statistic	6.6
A-D 5% Critical Value	0.8
K-S Test Statistic	0.4
K-S 5% Critical Value	0.1
Data do not follow gamma distribution at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	234.8
Adjusted Gamma UCL	238.8
Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.8
Shapiro-Wilk 5% Critical Value	0.9
Data not lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	176.3
95% Chebyshev (MVUE) UCL	188.5
97.5% Chebyshev (MVUE) UCL	236.0
99% Chebyshev (MVUE) UCL	329.5
95% Non-parametric UCLs	
CLT UCL	256.9
Adj-CLT UCL (Adjusted for skewness)	307.6
Mod-t UCL (Adjusted for skewness)	267.3
Jackknife UCL	259.4
Standard Bootstrap UCL	258.9
Bootstrap-t UCL	560.8
Hall's Bootstrap UCL	681.5
Percentile Bootstrap UCL	271.2
BCA Bootstrap UCL	320.2
95% Chebyshev (Mean, Sd) UCL	440.1
97.5% Chebyshev (Mean, Sd) UCL	567.4
99% Chebyshev (Mean, Sd) UCL	**817.5**

Data File | Variable: Trespasser Soil

Raw Statistics		Normal Distribution Test	
Number of Valid Samples	34	Shapiro-Wilk Test Statisitic	0.45
Number of Unique Samples	22	Shapiro-Wilk 5% Critical Value	0.93
Minimum	3.9	Data not normal at 5% significance level	
Maximum	212		
Mean	26.72	95% UCL (Assuming Normal Distribution)	
Median	13.5	Student's-t UCL	39.69
Standard Deviation	44.67		
Variance	1995.25	Gamma Distribution Test	
Coefficient of Variation	1.67	A-D Test Statistic	4.11
Skewness	3.42	A-D 5% Critical Value	0.77
		K-S Test Statistic	0.31
Gamma Statistics		K-S 5% Critical Value	0.16
k hat	1.06	Data do not follow gamma distribution	
k star (bias corrected)	0.99	at 5% significance level	
Theta hat	25.16		
Theta star	27.05	95% UCLs (Assuming Gamma Distribution)	
nu hat	72.23	Approximate Gamma UCL	36.41
nu star	67.19	Adjusted Gamma UCL	36.97
Approx.Chi Square Value (.05)	49.32		
Adjusted Level of Significance	0.04	Lognormal Distribution Test	
Adjusted Chi Square Value	48.56	Shapiro-Wilk Test Statisitic	0.84
		Shapiro-Wilk 5% Critical Value	0.93
Log-transformed Statistics		Data not lognormal at 5% significance level	
Minimum of log data	1.36		
Maximum of log data	5.36	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	2.75	95% H-UCL	31.35
Standard Deviation of log data	0.85	95% Chebyshev (MVUE) UCL	37.98
Variance of log data	0.73	97.5% Chebyshev (MVUE) UCL	44.84
		99% Chebyshev (MVUE) UCL	58.31
		95% Non-parametric UCLs	
		CLT UCL	39.32
		Adj-CLT UCL (Adjusted for skewness)	44.13
		Mod-t UCL (Adjusted for skewness)	40.44
		Jackknife UCL	39.69
		Standard Bootstrap UCL	39.01
		Bootstrap-t UCL	60.37
RECOMMENDATION		Hall's Bootstrap UCL	46.04
Data are Non-parametric (0.05)		Percentile Bootstrap UCL	39.92
		BCA Bootstrap UCL	45.90
Use 95% Chebyshev (Mean, Sd) UCL		**95% Chebyshev (Mean, Sd) UCL**	**60.12**
		97.5% Chebyshev (Mean, Sd) UCL	74.56
		99% Chebyshev (Mean, Sd) UCL	102.94

Data File | Variable: **Trespasser Sediment**

Raw Statistics		Normal Distribution Test	
Number of Valid Samples	9	Shapiro-Wilk Test Statisitic	0.78
Number of Unique Samples	9	Shapiro-Wilk 5% Critical Value	0.83
Minimum	96	Data not normal at 5% significance level	
Maximum	2300		
Mean	649.11	95% UCL (Assuming Normal Distribution)	
Median	310	Student's-t UCL	1100.46
Standard Deviation	728.15		
Variance	530204	Gamma Distribution Test	
Coefficient of Variation	1.12	A-D Test Statistic	0.43
Skewness	1.71	A-D 5% Critical Value	0.74
		K-S Test Statistic	0.22
Gamma Statistics		K-S 5% Critical Value	0.29
k hat	1.05	Data follow gamma distribution	
k star (bias corrected)	0.77	at 5% significance level	
Theta hat	618.57		
Theta star	839.01	95% UCLs (Assuming Gamma Distribution)	
nu hat	18.89	**Approximate Gamma UCL**	**1387**
nu star	13.93	Adjusted Gamma UCL	1647
Approx.Chi Square Value (.05)	6.52		
Adjusted Level of Significance	0.02	Lognormal Distribution Test	
Adjusted Chi Square Value	5.49	Shapiro-Wilk Test Statisitic	0.9
		Shapiro-Wilk 5% Critical Value	0.8
Log-transformed Statistics		Data are lognormal at 5% significance level	
Minimum of log data	4.56		
Maximum of log data	7.74	95% UCLs (Assuming Lognormal Distribution)	
Mean of log data	5.93	95% H-UCL	2917.4
Standard Deviation of log data	1.12	95% Chebyshev (MVUE) UCL	1718.7
Variance of log data	1.26	97.5% Chebyshev (MVUE) UCL	2186.0
		99% Chebyshev (MVUE) UCL	3104.0
		95% Non-parametric UCLs	
		CLT UCL	1048.3
		Adj-CLT UCL (Adjusted for skewness)	1196.5
		Mod-t UCL (Adjusted for skewness)	1123.6
		Jackknife UCL	1100.5
		Standard Bootstrap UCL	1040.4
		Bootstrap-t UCL	1621.2
RECOMMENDATION		Hall's Bootstrap UCL	2782.5
Data follow gamma distribution (0.05)		Percentile Bootstrap UCL	1067.2
		BCA Bootstrap UCL	1158.6
Use Approximate Gamma UCL		95% Chebyshev (Mean, Sd) UCL	1707.1
		97.5% Chebyshev (Mean, Sd) UCL	2164.9
		99% Chebyshev (Mean, Sd) UCL	3064.1

Arlington Ave Sediment

Data File

Raw Statistics	
Number of Valid Samples	14
Number of Unique Samples	10
Minimum	9.4
Maximum	46
Mean	21.5
Median	12
Standard Deviation	14.1
Variance	198.7
Coefficient of Variation	0.7
Skewness	0.8

Gamma Statistics	
k hat	2.8
k star (bias corrected)	2.2
Theta hat	7.7
Theta star	9.6
nu hat	78.3
nu star	62.8
Approx.Chi Square Value (.05)	45.6
Adjusted Level of Significance	0.0
Adjusted Chi Square Value	43.6

Log-transformed Statistics	
Minimum of log data	2.2
Maximum of log data	3.8
Mean of log data	2.9
Standard Deviation of log data	0.6
Variance of log data	0.4

RECOMMENDATION
Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.8
Shapiro-Wilk 5% Critical Value	0.9
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	28.2

Gamma Distribution Test	
A-D Test Statistic	1.3
A-D 5% Critical Value	0.7
K-S Test Statistic	0.3
K-S 5% Critical Value	0.2
Data do not follow gamma distribution at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	29.7
Adjusted Gamma UCL	31.0

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.8
Shapiro-Wilk 5% Critical Value	0.9
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	32.0
95% Chebyshev (MVUE) UCL	37.5
97.5% Chebyshev (MVUE) UCL	44.5
99% Chebyshev (MVUE) UCL	58.2

95% Non-parametric UCLs	
CLT UCL	27.7
Adj-CLT UCL (Adjusted for skewness)	28.6
Mod-t UCL (Adjusted for skewness)	28.3
Jackknife UCL	28.2
Standard Bootstrap UCL	27.6
Bootstrap-t UCL	29.4
Hall's Bootstrap UCL	27.0
Percentile Bootstrap UCL	27.7
BCA Bootstrap UCL	28.6
95% Chebyshev (Mean, Sd) UCL	**38.0**
97.5% Chebyshev (Mean, Sd) UCL	45.1
99% Chebyshev (Mean, Sd) UCL	59.0

Railroad Ditch Sediment

Data File

Raw Statistics	
Number of Valid Samples	6
Number of Unique Samples	5
Minimum	12
Maximum	169
Mean	67.67
Median	24
Standard Deviation	72.98
Variance	5326.27
Coefficient of Variation	1.08
Skewness	0.97

Gamma Statistics	
k hat	1.09
k star (bias corrected)	0.66
Theta hat	62.08
Theta star	103.13
nu hat	13.08
nu star	7.87
Approx.Chi Square Value (.05)	2.66
Adjusted Level of Significance	0.01
Adjusted Chi Square Value	1.70

Log-transformed Statistics	
Minimum of log data	2.48
Maximum of log data	5.13
Mean of log data	3.69
Standard Deviation of log data	1.11
Variance of log data	1.24

RECOMMENDATION
Data are lognormal (0.05)

Use 95% Chebyshev (MVUE) UCL

Recommended UCL exceeds the maximum observation
Default to maximum observation value = 169

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.71
Shapiro-Wilk 5% Critical Value	0.788
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	127.70

Gamma Distribution Test	
A-D Test Statistic	0.81
A-D 5% Critical Value	0.71
K-S Test Statistic	0.38
K-S 5% Critical Value	0.34
Data do not follow gamma distribution at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	200.2
Adjusted Gamma UCL	313.8

Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.8
Shapiro-Wilk 5% Critical Value	0.8
Data are lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	769.3
95% Chebyshev (MVUE) UCL	190.1
97.5% Chebyshev (MVUE) UCL	244.3
99% Chebyshev (MVUE) UCL	350.7

95% Non-parametric UCLs	
CLT UCL	116.7
Adj-CLT UCL (Adjusted for skewness)	129.3
Mod-t UCL (Adjusted for skewness)	129.7
Jackknife UCL	127.7
Standard Bootstrap UCL	112.3
Bootstrap-t UCL	688.7
Hall's Bootstrap UCL	1066.4
Percentile Bootstrap UCL	116.0
BCA Bootstrap UCL	117.8
95% Chebyshev (Mean, Sd) UCL	197.5
97.5% Chebyshev (Mean, Sd) UCL	253.7
99% Chebyshev (Mean, Sd) UCL	364.1

Appendix D

Post-Remediation Arsenic Risks

Post-Remediation Risks for Arsenic

Receptor/Exposure Pathway	Pre-Remediation			Post-Remediation		
	Arsenic EPC (mg/kg)	Cancer Risk	Hazard Index	Arsenic EPC (mg/kg)	Cancer Risk	Hazard Index
Onsite Construction Worker 2	123	7E-06	1	15.9	9E-07	0.1
Grassy Area Groundskeeper	779	7E-05	0.4	49.2	4E-06	0.03
Grassy Area Site Worker	779	1E-04	0.7	49.2	7E-06	0.04
Grassy Area Construction Worker 1	818	5E-05	2	24.0	1E-06	0.04
Grassy Area Construction Worker 2	818	5E-05	8	24.0	1E-06	0.2

Onsite Main Facility Area
Post-Remediation Arsenic Data Set
Construction Worker 2

Post-Remediation UCL (mg/kg)	15.9

Exposure Area	MATRIX	Station	SAMPLE ID	DEPTH	Arsenic	Lead	Samples removed for Lead Remediation	Post-remediation Arsenic Conc. (mg/kg)
Site	SOIL	CSB-10	CSB-10A-D	24-27"	2730	475000	x	5
Site	SOIL	CSB12	CSB12A	0-3"	1050	467000	x	5
Site	SOIL	CSB4	CSB4B	6-9"	164	460000	x	5
Site	SOIL	CSB12	CSB12B	6-9"	2270	372000	x	5
Site	SOIL	CSB11	CSB11B	6-9"	585	351000	x	5
Site	SOIL	CSB35	CSB-35A-C	12-15"	408	350000	x	5
Site	SOIL	CSB-10	CSB-10A-F	48-51"	1700	288000	x	5
Site	SOIL	CSB1	CSB1B	6-9"	599	268000	x	5
Site	SOIL	CSB-10	CSB-10A-C	12-15"	433	256000	x	5
Site	SOIL	CSB7	CSB7A	0-3"	81	255000	x	5
Site	SOIL	CSB1	CSB-1A-D	24-27"	989	249000	x	5
Site	SOIL	CSB-10	CSB10B	6-9"	916	236000	x	5
Site	SOIL	CSB4	CSB4A	0-3"	690	192000	x	5
Site	SOIL	CSB2	CSB2C	12-15"	469	180000	x	5
Site	SOIL	CSB2	CSB2A	0-3"	266	175000	x	5
Site	SOIL	CSB32	CSB-32A-A	0-3"	394	164000	x	5
Site	SOIL	CSB7	CSB7B	6-9"	788	154000	x	5
Site	SOIL	CSB3	CSB3B	6-9"	565	150000	x	5
Site	SOIL	CSB1	CSB1A	0-3"	406	139000	x	5
Site	SOIL	CSB-10	CSB10A	0-3"	709	132000	x	5
Site	SOIL	CSB3	CSB3A	0-3"	284	121000	x	5
Site	SOIL	CSB11	CSB11A	0-3"	237	104000	x	5
Site	SOIL	CSB34	CSB34A	0-3"	189	94500	x	5
Site	SOIL	CSB3	CSB3D	24-28"	193	93900	x	5
Site	SOIL	CSB32	CSB-32A-B	6-9"	199	90100	x	5
Site	SOIL	CSB8	CSB8A	0-3"	66	83800	x	5
Site	SOIL	RSB25	RSB25A	0-3"	867	83500	x	5
Site	SOIL	CSB3	CSB3C	12-15"	217	78100	x	5
Site	SOIL	CSB7	CSB7C	12-15"	343	77200	x	5
Site	SOIL	CSB35	CSB-35A-A	0-3"	154	70400	x	5
Site	SOIL	RSB71	RSB71A	0-3"	215	66800	x	5
Site	SOIL	CSB32	CSB-32A-C	12-15"	230	64000	x	5
Site	SOIL	CSB2	CSB2B	6-9"	159	58400	x	5
Site	SED	RSED6	RSED6A	0-6"	305	57200	x	5
Site	SOIL	CSB51	CSB51A	0-3"	265	47300	x	5
Site	SOIL	CSB39	CSB39A	0-3"	863	46800	x	5
Site	SOIL	CSB32	CSB32A	0-3"	388	42800	x	5
Site	SOIL	RSB58	RSB58A	0-3"	247	32000	x	5
Site	SOIL	RSB31	RSB31B	3-10"	232	27400	x	5
Site	SOIL	RSB55	RSB55A	0-3"	323	27400	x	5
Site	SOIL	RSB55	RSB55B	3-10"	359	27000	x	5
Site	SOIL	RSB31	RSB31A	0-3"	202	23700	x	5
Site	SOIL	RSB54	RSB54A	0-3"	107	22800	x	5
Site	SOIL	RSB58	RSB58B	3-10"	200	21000	x	5
Site	SOIL	CSB51	CSB51D	24-28"	36	18700	x	5
Site	SOIL	RSB12	RSB12B	3-10"	125	17500	x	5
Site	SOIL	RSB57	RSB57B	3-10"	127	17400	x	5
Site	SOIL	RSB54	RSB54B	3-10"	94	17300	x	5
Site	SOIL	RSB57	RSB57A	0-3"	235	17000	x	5
Site	SED	RSED6	RSED6B	6-12"	114	14800	x	5
Site	SOIL	RSB55	RSB55C	24-30"	60	13100	x	5
Site	SOIL	CSB51	CSB51E	36-39"	26	12000	x	5

Onsite Main Facility Area
Post-Remediation Arsenic Data Set
Construction Worker 2

Post-Remediation UCL (mg/kg)	15.9

Exposure Area	MATRIX	Station	SAMPLE ID	DEPTH	Arsenic	Lead	Samples removed for Lead Remediation	Post-remediation Arsenic Conc. (mg/kg)
Site	SOIL	RSB12	RSB12A	0-3"	95	11100	x	5
Site	SOIL	RSB58	RSB58C	24-30"	37	11100	x	5
Site	SOIL	CSB35	CSB35D	24-28"	12	10800	x	5
Site	SOIL	RSB77	RSB77A	0-3"	7	10700	x	5
Site	SOIL	CSB51	CSB51B	6-9"	187	10300	x	5
Site	SOIL	RSB26	RSB26A	0-3"	175	9670	x	5
Site	SOIL	RSB14	RSB14B	3-10"	15	8480	x	5
Site	SOIL	RSB26	RSB26B	3-10"	184	8130		184
Site	SOIL	RSB14	RSB14A	0-3"	24	8100		24
Site	SOIL	CSB51	CSB51F	48-51"	18	8020		18
Site	SOIL	RSB25	RSB25B	3-10"	104	7930		104
Site	SOIL	RSB73	RSB73A	0-3"	18	6710		18
Site	SOIL	CSB40	CSB40A	0-3"	39	6660		39
Site	SOIL	CSB38	CSB-38A-A	0-3"	67	6200		67
Site	SOIL	CSB51	CSB51C	12-15"	17	5680		17
Site	SOIL	CSB35	CSB35E	36-39"	15	4910		15
Site	SOIL	RSB57	RSB57C	24-30"	16	3850		16
Site	SOIL	RSB75	RSB75A	0-3"	58	3220		58
Site	SOIL	RSB28	RSB28A	0-3"	56	3140		56
Site	SOIL	CSB35	CSB35A	0-3"	8.4	3090		8.4
Site	SOIL	RSB78	RSB78A	0-3"	14	3060		14
Site	SOIL	CSB35	CSB35F	48-51"	12	3010		12
Site	SOIL	RSB78	RSB78C	24-30"	13	2960		13
Site	SOIL	RSB77	RSB77B	3-10"	7.7	2920		7.7
Site	SOIL	RSB78	RSB78B	3-10"	12	2600		12
Site	SOIL	CSB25	CSB25B	6-9"	75	2420		75
Site	SOIL	CSB30	CSB-30A-A	0-3"	30	2360		30
Site	SOIL	CSB34	CSB34B	6-9"	9.1	2360		9.1
Site	SOIL	CSB13	CSB-13A-A	0-3"	11	2300		11
Site	SOIL	CSB31	CSB31B	6-9"	22	2280		22
Site	SOIL	RSB33	RSB33A	0-3"	56	2200		56
Site	SOIL	RSB38	RSB38A	0-3"	14	2000		14
Site	SOIL	CSB-10	CSB-10A-A	0-3"	4.5	1780		4.5
Site	SOIL	CSB-10	CSB10C	12-15"	17	1500		17
Site	SOIL	RSB75	RSB75B	3-10"	15	1500		15
Site	SOIL	RSB29	RSB29A	0-3"	23	1480		23
Site	SOIL	CSB35	CSB35C	12-15"	7	1400		7
Site	SOIL	CSB-10	CSB-10A-B	6-9"	6.1	1210		6.1
Site	SOIL	CSB13	CSB-13A-B	6-9"	22	1070		22
Site	SOIL	RSB15	RSB15A	0-3"	22	1070		22
Site	SOIL	CSB8	CSB8B	6-9"	10	989		10
Site	SOIL	RSB23	RSB23A	0-3"	18	987		18
Site	SOIL	RSB75	RSB75C	24-30"	12	962		12
Site	SOIL	CSB1	CSB-1A-A	0-3"	3.2	903		3.2
Site	SOIL	CSB33	CSB33B	6-9"	12	868		12
Site	SOIL	CSB1	CSB-1A-E	36-39"	6.8	847		6.8
Site	SOIL	RSB32	RSB32A	0-3"	13	841		13
Site	SOIL	CSB32	CSB32C	12-15"	7	694		7
Site	SOIL	RSB37	RSB37A	0-3"	17	679		17
Site	SOIL	RSB76	RSB76B	3-10"	10	648		10
Site	SOIL	RSB37	RSB37B	3-10"	13	594		13
Site	SOIL	RSB20	RSB20A	0-3"	14	593		14

Onsite Main Facility Area
Post-Remediation Arsenic Data Set
Construction Worker 2

Post-Remediation UCL (mg/kg)	15.9

Exposure Area	MATRIX	Station	SAMPLE ID	DEPTH	Arsenic	Lead	Samples removed for Lead Remediation	Post-remediation Arsenic Conc. (mg/kg)
Site	SOIL	CSB26	CSB26C	12-15"	8.6	583		8.6
Site	SOIL	CSB-10	CSB10D	12-15"	6.9	548		6.9
Site	SOIL	RSB32	RSB32B	3-10"	7.7	531		7.7
Site	SOIL	RSB17	RSB17A	0-3"	10	530		10
Site	SOIL	RSB18	RSB18A	0-3"	7.8	526		7.8
Site	SOIL	CSB11	CSB11C	12-15"	14	522		14
Site	SOIL	CSB35	CSB35B	6-9"	9.5	518		9.5
Site	SOIL	CSB1	CSB1C	12-15"	8	511		8
Site	SOIL	CSB35	CSB-35A-E	36-39"	6.3	499		6.3
Site	SOIL	CSB50	CSB50A	0-3"	15	480		15
Site	SOIL	RSB22	RSB22A	0-3"	21	478		21
Site	SOIL	RSB28	RSB28B	3-10"	16	478		16
Site	SOIL	RSB38	RSB38B	3-10"	7.2	440		7.2
Site	SOIL	CSB31	CSB31A	0-3"	14	431		14
Site	SOIL	CSB25	CSB25A	0-3"	13	411		13
Site	SOIL	CSB32	CSB32B	6-9"	7.4	403		7.4
Site	SOIL	RSB74	RSB74A	0-3"	13	380		13
Site	SOIL	CSB30	CSB-30A-B	6-9"	13	366		13
Site	SOIL	CSB12	CSB12C	12-15"	14	353		14
Site	SOIL	RSB29	RSB29B	3-10"	11	350		11
Site	SOIL	CSB21	CSB21B	6-9"	9.3	329		9.3
Site	SOIL	CSB37	CSB37A	0-3"	30	325		30
Site	SOIL	CSB13	CSB13A	0-3"	38	323		38
Site	SOIL	CSB38	CSB-38A-E	36-39"	8.6	319		8.6
Site	SOIL	CSB37	CSB37B	6-9"	7.9	314		7.9
Site	SOIL	CSB9	CSB9A	0-3"	12	289		12
Site	SOIL	CSB35	CSB-35A-D	24-27"	6	285		6
Site	SOIL	CSB35	CSB-35A-B	6-9"	6.1	279		6.1
Site	SOIL	CSB8	CSB8C	12-15"	10	279		10
Site	SOIL	CSB-10	CSB-10A-E	36-39"	7.1	253		7.1
Site	SOIL	CSB33	CSB33C	12-15"	13	245		13
Site	SOIL	CSB30	CSB-30A-C	12-15"	9.1	243		9.1
Site	SOIL	CSB37	CSB37C	12-15"	6.8	242		6.8
Site	SOIL	RSB22	RSB22B	3-10"	10	237		10
Site	SOIL	CSB16	CSB16C	12-15"	7.5	234		7.5
Site	SOIL	CSB3	CSB3E	36-39"	12	232		12
Site	SOIL	RSB77	RSB77C	24-30"	6.6	232		6.6
Site	SOIL	CSB50	CSB50C	12-15"	10	229		10
Site	SOIL	RSB81	RSB81A	0-3"	9.4	229		9.4
Site	SOIL	RSB15	RSB15B	3-10"	10	211		10
Site	SOIL	CSB16	CSB16A	0-3"	6	209		6
Site	SOIL	RSB79	RSB79B	3-10"	6.9	205		6.9
Site	SOIL	CSB33	CSB33A	0-3"	13	196		13
Site	SOIL	CSB16	CSB16B	6-9"	7.2	195		7.2
Site	SOIL	CSB26	CSB26A	0-3"	7.7	191		7.7
Site	SOIL	CSB19	CSB19A	0-3"	9	187		9
Site	SOIL	RSB73	RSB73C	24-30"	7.6	178		7.6
Site	SOIL	RSB74	RSB74B	3-10"	9	177		9
Site	SOIL	CSB-26	CSB-26A-A	0-3"	12	174		12
Site	SOIL	CSB1	CSB-1A-F	48-51"	8.5	170		8.5
Site	SOIL	CSB6	CSB6A	0-3"	8.9	165		8.9
Site	SOIL	RSB79	RSB79C	24-30"	8.1	164		8.1

Onsite Main Facility Area
Post-Remediation Arsenic Data Set
Construction Worker 2

Post-Remediation UCL (mg/kg)	15.9

Exposure Area	MATRIX	Station	SAMPLE ID	DEPTH	Arsenic	Lead	Samples removed for Lead Remediation	Post-remediation Arsenic Conc. (mg/kg)
Site	SOIL	RSB23	RSB23B	3-10"	2.6	157		2.6
Site	SOIL	RSB54	RSB54C	24-30"	3.4	151		3.4
Site	SOIL	CSB49	CSB49A	0-3"	8.1	147		8.1
Site	SOIL	RSB73	RSB73B	3-10"	11	145		11
Site	SOIL	CSB9	CSB9B	6-9"	11	132		11
Site	SOIL	CSB50	CSB50B	6-9"	13	131		13
Site	SOIL	CSB19	CSB19C	12-15"	6.7	129		6.7
Site	SOIL	CSB5	CSB5A	0-3"	7.2	125		7.2
Site	SOIL	CSB7	CSB7D	24-28"	6.9	114		6.9
Site	SOIL	CSB25	CSB25C	12-15"	8.8	108		8.8
Site	SOIL	CSB36	CSB36A	0-3"	170	103		170
Site	SOIL	CSB17	CSB17C	12-15"	6.9	101		6.9
Site	SOIL	RSB20	RSB20B	3-10"	10	97		10
Site	SOIL	CSB15	CSB15B	6-9"	7.8	89		7.8
Site	SOIL	CSB-26	CSB-26A-B	6-9"	11	88		11
Site	SOIL	RSB56	RSB56C	24-30"	6.1	88		6.1
Site	SOIL	CSB17	CSB17A	0-3"	7.3	87		7.3
Site	SOIL	RSB80	RSB80A	0-3"	7.4	85		7.4
Site	SOIL	CSB19	CSB19B	6-9"	6.8	79		6.8
Site	SOIL	RSB52	RSB52B	3-10"	5.9	77		5.9
Site	SOIL	CSB36	CSB36B	6-9"	15	76		15
Site	SOIL	CSB13	CSB-13A-C	12-15"	6.6	75		6.6
Site	SOIL	RSB74	RSB74C	24-30"	4.9	75		4.9
Site	SOIL	CSB26	CSB26B	6-9"	6.5	73		6.5
Site	SOIL	RSB76	RSB76C	24-30"	7.7	72		7.7
Site	SOIL	CSB18	CSB18A	0-3"	7.8	70		7.8
Site	SOIL	CSB35	CSB-35A-F	48-51"	6.3	69		6.3
Site	SOIL	CSB39	CSB39B	6-9"	8	69		8
Site	SOIL	CSB6	CSB6C	12-15"	11	69		11
Site	SOIL	CSB34	CSB34C	12-15"	7	68		7
Site	SOIL	CSB36	CSB36C	12-15"	12	67		12
Site	SOIL	CSB5	CSB5B	6-9"	7.1	67		7.1
Site	SOIL	RSB52	RSB52C	24-30"	6.9	67		6.9
Site	SOIL	CSB4	CSB4C	12-15"	6.8	65		6.8
Site	SOIL	RSB79	RSB79A	0-3"	8.5	57		8.5
Site	SOIL	CSB9	CSB9C	12-15"	7.7	53		7.7
Site	SOIL	CSB6	CSB6B	6-9"	9.6	50		9.6
Site	SOIL	RSB18	RSB18B	3-10"	6.3	50		6.3
Site	SOIL	CSB13	CSB13C	12-15"	10	49		10
Site	SOIL	CSB41	CSB41A	0-3"	4.8	45		4.8
Site	SOIL	CSB1	CSB-1A-C	12-15"	1.5	44		1.5
Site	SOIL	CSB29	CSB29B	6-9"	25	44		25
Site	SOIL	CSB5	CSB5C	12-15"	5.1	42		5.1
Site	SOIL	CSB-26	CSB-26A-C	12-15"	6.4	40		6.4
Site	SOIL	CSB32	CSB-32A-D	24-27"	8	40		8
Site	SOIL	CSB13	CSB-13A-D	24-27"	5.9	39		5.9
Site	SOIL	CSB18	CSB18C	12-15"	8.3	38		8.3
Site	SOIL	RSB82	RSB82B	3-10"	24	37		24
Site	SOIL	CSB29	CSB29C	12-15"	11	36		11
Site	SOIL	RSB72	RSB72A	0-3"	8.7	34		8.7
Site	SOIL	CSB21	CSB21C	12-15"	6.8	32		6.8
Site	SOIL	CSB23	CSB23C	12-15"	6.2	32		6.2

Onsite Main Facility Area
Post-Remediation Arsenic Data Set
Construction Worker 2

Post-Remediation UCL (mg/kg)	15.9

Exposure Area	MATRIX	Station	SAMPLE ID	DEPTH	Arsenic	Lead	Samples removed for Lead Remediation	Post-remediation Arsenic Conc. (mg/kg)
Site	SOIL	CSB29	CSB29A	0-3"	9.2	32		9.2
Site	SOIL	CSB30	CSB-30A-D	24-27"	6.6	32		6.6
Site	SOIL	CSB21	CSB21A	0-3"	7.8	31		7.8
Site	SOIL	RSB83	RSB83C	24-30"	16	31		16
Site	SOIL	CSB13	CSB13B	6-9"	11	30		11
Site	SOIL	CSB20	CSB20A	0-3"	9.6	30		9.6
Site	SOIL	CSB28	CSB-28A-A	0-3"	53	30		53
Site	SOIL	RSB56	RSB56A	0-3"	8.6	30		8.6
Site	SOIL	CSB28	CSB28C	12-15"	23	29		23
Site	SOIL	CSB14	CSB14A	0-3"	2.2	28		2.2
Site	SOIL	CSB15	CSB15C	12-15"	5.3	28		5.3
Site	SOIL	CSB24	CSB24A	0-3"	4.8	28		4.8
Site	SOIL	CSB13	CSB-13A-E	36-39"	6	27		6
Site	SOIL	CSB28	CSB-28A-C	12-15"	7.9	27		7.9
Site	SOIL	RSB56	RSB56B	3-10"	7.7	27		7.7
Site	SOIL	CSB18	CSB18B	6-9"	6	26		6
Site	SOIL	CSB-26	CSB-26A-D	24-27"	6.2	25		6.2
Site	SOIL	RSB52	RSB52A	0-3"	6.6	25		6.6
Site	SOIL	CSB20	CSB20C	12-15"	2.4	23		2.4
Site	SOIL	CSB-26	CSB-26A-E	36-39"	5.8	23		5.8
Site	SOIL	RSB80	RSB80B	3-10"	7	23		7
Site	SOIL	RSB80	RSB80C	24-30"	6.7	23		6.7
Site	SOIL	CSB27	CSB27A	0-3"	6.3	22		6.3
Site	SOIL	CSB38	CSB38A	0-3"	4.9	22		4.9
Site	SOIL	CSB38	CSB-38A-C	12-15"	9.3	22		9.3
Site	SOIL	RSB33	RSB33B	3-10"	10	22		10
Site	SOIL	RSB17	RSB17B	3-10"	9.7	21		9.7
Site	SOIL	RSB53	RSB53A	0-3"	8.2	21		8.2
Site	SOIL	RSB84	RSB84B	3-10"	15	21		15
Site	SOIL	CSB17	CSB17B	6-9"	7.1	20		7.1
Site	SOIL	CSB24	CSB24B	6-9"	9.3	20		9.3
Site	SOIL	CSB32	CSB-32A-E	36-39"	6.5	20		6.5
Site	SOIL	CSB40	CSB40B	6-9"	6.4	20		6.4
Site	SOIL	CSB20	CSB20B	6-9"	6.9	19		6.9
Site	SOIL	CSB28	CSB28B	6-9"	10	19		10
Site	SOIL	CSB38	CSB38C	12-15"	7.8	19		7.8
Site	SOIL	CSB7	CSB7E	36-39"	6.2	19		6.2
Site	SOIL	RSB34	RSB34A	0-3"	6.5	19		6.5
Site	SOIL	RSB34	RSB34B	3-10"	6.3	19		6.3
Site	SOIL	CSB1	CSB-1A-B	6-9"	1.5	18		1.5
Site	SOIL	CSB14	CSB14C	12-15"	6.4	18		6.4
Site	SOIL	CSB49	CSB49B	6-9"	6.4	18		6.4
Site	SOIL	RSB53	RSB53B	3-10"	8.3	18		8.3
Site	SOIL	RSB81	RSB81B	3-10"	9.3	18		9.3
Site	SOIL	CSB49	CSB49C	12-15"	6.8	17		6.8
Site	SOIL	RSB53	RSB53C	24-30"	6.9	17		6.9
Site	SOIL	RSB83	RSB83A	0-3"	9.9	17		9.9
Site	SOIL	CSB28	CSB-28A-E	36-39"	9.4	16		9.4
Site	SOIL	CSB30	CSB30A	0-3"	9.5	16		9.5
Site	SOIL	RSB82	RSB82A	0-3"	8.5	16		8.5
Site	SOIL	RSB82	RSB82C	24-30"	9.3	16		9.3
Site	SOIL	RSB84	RSB84A	0-3"	10	16		10

Onsite Main Facility Area
Post-Remediation Arsenic Data Set
Construction Worker 2

Post-Remediation UCL (mg/kg)	15.9

Exposure Area	MATRIX	Station	SAMPLE ID	DEPTH	Arsenic	Lead	Samples removed for Lead Remediation	Post-remediation Arsenic Conc. (mg/kg)
Site	SOIL	CSB30	CSB30C	12-15"	11	15		11
Site	SOIL	CSB38	CSB38B	6-9"	4.4	15		4.4
Site	SOIL	CSB39	CSB39C	12-15"	5.8	15		5.8
Site	SOIL	CSB42	CSB42C	12-15"	7.8	15		7.8
Site	SOIL	RSB72	RSB72B	3-10"	7	15		7
Site	SOIL	RSB72	RSB72C	24-30"	8.2	15		8.2
Site	SOIL	CSB27	CSB27C	12-15"	6.4	14		6.4
Site	SOIL	CSB28	CSB28A	0-3"	4.4	14		4.4
Site	SOIL	CSB28	CSB-28A-D	24-27"	6.5	14		6.5
Site	SOIL	CSB38	CSB-38A-B	6-9"	7.9	14		7.9
Site	SOIL	CSB40	CSB40C	12-15"	11	14		11
Site	SOIL	RSB27	RSB27A	0-3"	8.1	14		8.1
Site	SOIL	RSB27	RSB27B	3-10"	6.5	14		6.5
Site	SOIL	CSB27	CSB27B	6-9"	8.5	13		8.5
Site	SOIL	CSB28	CSB-28A-B	6-9"	5.1	13		5.1
Site	SOIL	CSB30	CSB-30A-E	36-39"	6.6	13		6.6
Site	SOIL	CSB30	CSB30B	6-9"	6.7	13		6.7
Site	SOIL	RSB19	RSB19B	3-10"	6.8	13		6.8
Site	SOIL	CSB24	CSB24C	12-15"	4.4	12		4.4
Site	SOIL	CSB38	CSB-38A-D	24-27"	2.5	12		2.5
Site	SOIL	RSB84	RSB84C	24-30"	5.7	12		5.7
Site	SOIL	CSB23	CSB23B	6-9"	7	11		7
Site	SOIL	CSB42	CSB42A	0-3"	23	11		23
Site	SOIL	CSB42	CSB42B	6-9"	73	11		73
Site	SOIL	RSB19	RSB19A	0-3"	7	11		7
Site	SOIL	RSB81	RSB81C	24-30"	7	11		7
Site	SOIL	RSB83	RSB83B	3-10"	7.4	11		7.4
Site	SOIL	CSB23	CSB23A	0-3"	7.5	10		7.5
Site	SOIL	CSB31	CSB31C	12-15"	6.7	10		6.7
Site	SOIL	CSB14	CSB14B	6-9"	5.7	9.8		5.7
Site	SOIL	CSB22	CSB22C	12-15"	6.6	9.8		6.6
Site	SOIL	CSB15	CSB15A	0-3"	7	9.6		7
Site	SOIL	RSB85	RSB85A	0-3"	7.1	9.1		7.1
Site	SOIL	CSB41	CSB41B	6-9"	7.6	8.9		7.6
Site	SOIL	CSB41	CSB41C	12-15"	6.3	8.8		6.3
Site	SOIL	RSB85	RSB85C	24-30"	7	8.7		7
Site	SOIL	RSB85	RSB85B	3-10"	6.7	8.2		6.7
Site	SOIL	CSB22	CSB22A	0-3"	6.3	8		6.3
Site	SOIL	CSB22	CSB22B	6-9"	6.7	7.7		6.7
Site	SOIL	RSB76	RSB76A	0-3"	24	4.7		24

Grassy Area Soil and Sediment combined (0-6")
Post-Remediation Arsenic Data Set
Groundskeeper and Site Worker

Post-Remediation UCL (mg/kg)	49.2

MATRIX	DEPTH	Station	As Conc (mg/kg)	Samples removed for Lead Remediation	Post-remediation Arsenic Conc. (mg/kg)
SED	0-6"	RSED1	310	x	5
SED	0-6"	RSED2	713	x	5
SED	0-6"	RSED3	740	x	5
SED	0-6"	RSED4	2300	x	5
SED	0-6"	RSED5	1230	x	5
SED	0-6"	RSED7	170	x	5
SED	0-6"	RSED8	159	x	5
SED	0-6"	RSED9	124	x	5
SED	0-6"	RSED10	96	x	5
SOIL	0-3"	BSB1	5.5		5.5
SOIL	0-3"	BSB2	13		13
SOIL	0-3"	BSB3	7		7
SOIL	0-3"	BSB4	16		16
SOIL	0-3"	RSB1	11		11
SOIL	0-3"	RSB10	14		14
SOIL	0-3"	RSB11	13		13
SOIL	0-3"	RSB13	11		11
SOIL	0-3"	RSB16	13		13
SOIL	0-3"	RSB2	14		14
SOIL	0-3"	RSB21	8.3		8.3
SOIL	0-3"	RSB24	20		20
SOIL	0-3"	RSB3	9.1		9.1
SOIL	0-3"	RSB30	15		15
SOIL	0-3"	RSB35	10		10
SOIL	0-3"	RSB36	9.2		9.2
SOIL	0-3"	RSB39	10		10
SOIL	0-3"	RSB4	22		22
SOIL	0-3"	RSB40	19		19
SOIL	0-3"	RSB41	10		10
SOIL	0-3"	RSB42	15		15
SOIL	0-3"	RSB43	20		20
SOIL	0-3"	RSB44	9.5		9.5
SOIL	0-3"	RSB45	6.1		6.1
SOIL	0-3"	RSB46	3.9		3.9
SOIL	0-3"	RSB49	20		20
SOIL	0-3"	RSB5	10		10
SOIL	0-3"	RSB50	38		38
SOIL	0-3"	RSB51	169		169
SOIL	0-3"	RSB6	22		22
SOIL	0-3"	RSB7	14		14
SOIL	0-3"	RSB-70	212		212
SOIL	0-3"	RSB8	23		23
SOIL	0-3"	RSB9	96		96

Grassy Area Soil (0 - 30")
Post-Remediation Arsenic Data Set
Construction Worker 1 and 2

Post-Remediation UCL (mg/kg)	24.0

MATRIX	Station	DEPTH	Arsenic	Samples removed for Lead Remediation	Post-remediation Arsenic Conc. (mg/kg)
SED	RSED4	0-6"	2300	x	5
SED	RSED5	0-6"	1230	x	5
SED	RSED5	6-12"	3880	x	5
SED	RSED3	0-6"	740	x	5
SED	RSED2	0-6"	713	x	5
SED	RSED7	0-6"	170	x	5
SED	RSED8	0-6"	159	x	5
SED	RSED9	0-6"	124	x	5
SED	RSED1	6-12"	263	x	5
SED	RSED10	0-6"	96	x	5
SED	RSED8	6-12"	103	x	5
SED	RSED7	6-12"	78	x	5
SED	RSED1	0-6"	310	x	5
SED	RSED4	6-12"	531	x	5
SED	RSED10	6-12"	61	x	5
SED	RSED9	6-12"	50	x	5
SOIL	RSB9	0-3"	96	x	5
SOIL	RSB-70	3-10"	323	x	5
SOIL	RSB51	0-3"	169	x	5
SED	RSED3	6-12"	184	x	5
SOIL	RSB-70	0-3"	212	x	5
SOIL	RSB50	0-3"	38	x	5
SOIL	RSB51	3-10"	77		77
SED	RSED2	6-12"	229		229
SOIL	RSB9	3-10"	27		27
SOIL	RSB51	24-30"	43		43
SOIL	RSB4	0-3"	22		22
SOIL	RSB24	0-3"	20		20
SOIL	RSB6	0-3"	22		22
SOIL	RSB10	0-3"	14		14
SOIL	BSB2	0-3"	13		13
SOIL	RSB7	0-3"	14		14
SOIL	RSB43	0-3"	20		20
SOIL	RSB2	0-3"	14		14
SOIL	BSB4	0-3"	16		16
SOIL	RSB49	0-3"	20		20
SOIL	RSB8	0-3"	23		23
SOIL	RSB5	0-3"	10		10
SOIL	RSB40	0-3"	19		19
SOIL	RSB50	3-10"	9		9
SOIL	RSB30	0-3"	15		15
SOIL	RSB1	0-3"	11		11
SOIL	RSB50	24-30"	12		12
SOIL	RSB42	0-3"	15		15
SOIL	BSB4	3-10"	12		12
SOIL	RSB4	3-10"	9.8		9.8
SOIL	RSB13	0-3"	11		11
SOIL	RSB49	3-10"	1.4		1.4
SOIL	RSB16	0-3"	13		13
SOIL	RSB11	0-3"	13		13
SOIL	RSB3	0-3"	9.1		9.1
SOIL	RSB3	3-10"	7		7
SOIL	RSB21	0-3"	8.3		8.3

Grassy Area Soil (0 - 30")
Post-Remediation Arsenic Data Set
Construction Worker 1 and 2

Post-Remediation UCL (mg/kg)	24.0

MATRIX	Station	DEPTH	Arsenic	Samples removed for Lead Remediation	Post-remediation Arsenic Conc. (mg/kg)
SOIL	RSB45	0-3"	6.1		6.1
SOIL	RSB46	0-3"	3.9		3.9
SOIL	RSB44	0-3"	9.5		9.5
SOIL	RSB5	3-10"	7.5		7.5
SOIL	RSB41	0-3"	10		10
SOIL	RSB8	3-10"	9.1		9.1
SOIL	RSB6	3-10"	9		9
SOIL	RSB24	3-10"	6.5		6.5
SOIL	BSB1	24-30"	10		10
SOIL	BSB3	0-3"	7		7
SOIL	RSB10	3-10"	6.6		6.6
SOIL	RSB45	3-10"	10		10
SOIL	RSB7	3-10"	6.8		6.8
SOIL	RSB43	3-10"	11		11
SOIL	RSB39	0-3"	10		10
SOIL	RSB36	0-3"	9.2		9.2
SOIL	RSB46	3-10"	5.4		5.4
SOIL	RSB1	3-10"	6.2		6.2
SOIL	RSB42	3-10"	7.3		7.3
SOIL	RSB2	3-10"	6.6		6.6
SOIL	RSB40	3-10"	7		7
SOIL	BSB1	0-3"	5.5		5.5
SOIL	RSB30	3-10"	7.4		7.4
SOIL	RSB21	3-10"	7.2		7.2
SOIL	RSB11	3-10"	5.1		5.1
SOIL	RSB13	3-10"	5		5
SOIL	RSB16	3-10"	5.6		5.6
SOIL	RSB41	3-10"	5.7		5.7
SOIL	RSB39	3-10"	7.6		7.6
SOIL	BSB2	3-10"	5.1		5.1
SOIL	BSB1	3-10"	5.9		5.9
SOIL	RSB36	3-10"	5.7		5.7
SOIL	RSB44	3-10"	8.9		8.9
SOIL	RSB35	0-3"	10		10
SOIL	RSB35	3-10"	6.4		6.4
SOIL	BSB3	3-10"	5.4		5.4
SOIL	RSB-70	24-30"	5.5		5.5

Onsite Main Facility Area
Post-Remediation Arsenic UCL

Raw Statistics	
Number of Valid Samples	300.00
Number of Unique Samples	82.00
Minimum	1.50
Maximum	184.00
Mean	11.43
Median	7.10
Standard Deviation	17.57
Variance	308.86
Coefficient of Variation	1.54
Skewness	6.80

Gamma Statistics	
k hat	1.72
k star (bias corrected)	1.71
Theta hat	6.64
Theta star	6.70
nu hat	1033.10
nu star	1024.10
Approx.Chi Square Value (.05)	950.80
Adjusted Level of Significance	0.05
Adjusted Chi Square Value	950.46

Log-transformed Statistics	
Minimum of log data	0.41
Maximum of log data	5.21
Mean of log data.	2.12
Standard Deviation of log data	0.64
Variance of log data	0.41

RECOMMENDATION
Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Normal Distribution Test	
Lilliefors Test Statisitic	0.317927
Lilliefors 5% Critical Value	0.051153
Data not normal at 5% significance level	

95% UCL (Assuming Normal Distribution)	
Student's-t UCL	13.10314

Gamma Distribution Test	
A-D Test Statistic	26.26617
A-D 5% Critical Value	0.769287
K-S Test Statistic	0.225085
K-S 5% Critical Value	0.052932
Data do not follow gamma distribution at 5% significance level	

95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	12.31013
Adjusted Gamma UCL	12.31448

Lognormal Distribution Test	
Lilliefors Test Statisitic	0.159646
Lilliefors 5% Critical Value	0.051153
Data not lognormal at 5% significance level	

95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	10.93425
95% Chebyshev (MVUE) UCL	11.99267
97.5% Chebyshev (MVUE) UCL	12.76967
99% Chebyshev (MVUE) UCL	14.29592

95% Non-parametric UCLs	
CLT UCL	13.09796
Adj-CLT UCL (Adjusted for skewness)	13.52381
Mod-t UCL (Adjusted for skewness)	13.16957
Jackknife UCL	13.10314
Standard Bootstrap UCL	13.08214
Bootstrap-t UCL	13.95347
Hall's Bootstrap UCL	14.18564
Percentile Bootstrap UCL	13.233
BCA Bootstrap UCL	13.72167
95% Chebyshev (Mean, Sd) UCL	**15.85**
97.5% Chebyshev (Mean, Sd) UCL	17.76551
99% Chebyshev (Mean, Sd) UCL	21.52468

Grassy Area Soil and Sediment combined (0-6")
Post-Remediation Arsenic UCL

Raw Statistics	
Number of Valid Samples	43.0
Number of Unique Samples	23.0
Minimum	3.9
Maximum	212.0
Mean	22.2
Median	11.0
Standard Deviation	40.6
Variance	1647.7
Coefficient of Variation	1.8
Skewness	3.9

Gamma Statistics	
k hat	1.0
k star (bias corrected)	0.9
Theta hat	22.7
Theta star	23.9
nu hat	84.2
nu star	79.7
Approx.Chi Square Value (.05)	60.1
Adjusted Level of Significance	0.0
Adjusted Chi Square Value	59.5

Log-transformed Statistics	
Minimum of log data	1.4
Maximum of log data	5.4
Mean of log data	2.5
Standard Deviation of log data	0.9
Variance of log data	0.8

Normal Distribution Test	
Shapiro-Wilk Test Statisitic	0.429
Shapiro-Wilk 5% Critical Value	0.943
Data not normal at 5% significance level	
95% UCL (Assuming Normal Distribution)	
Student's-t UCL	32.59
Gamma Distribution Test	
A-D Test Statistic	4.347
A-D 5% Critical Value	0.779
K-S Test Statistic	0.26
K-S 5% Critical Value	0.139
Data do not follow gamma distribution at 5% significance level	
95% UCLs (Assuming Gamma Distribution)	
Approximate Gamma UCL	29.4
Adjusted Gamma UCL	29.69
Lognormal Distribution Test	
Shapiro-Wilk Test Statisitic	0.85
Shapiro-Wilk 5% Critical Value	0.943
Data not lognormal at 5% significance level	
95% UCLs (Assuming Lognormal Distribution)	
95% H-UCL	24.83
95% Chebyshev (MVUE) UCL	30.18
97.5% Chebyshev (MVUE) UCL	35.44
99% Chebyshev (MVUE) UCL	45.78
95% Non-parametric UCLs	
CLT UCL	32.36
Adj-CLT UCL (Adjusted for skewness)	36.25
Mod-t UCL (Adjusted for skewness)	33.19
Jackknife UCL	32.59
Standard Bootstrap UCL	32.52
Bootstrap-t UCL	50.34
Hall's Bootstrap UCL	39.99
Percentile Bootstrap UCL	33.48
BCA Bootstrap UCL	37.04
95% Chebyshev (Mean, Sd) UCL	**49.16**
97.5% Chebyshev (Mean, Sd) UCL	60.83
99% Chebyshev (Mean, Sd) UCL	83.77

RECOMMENDATION
Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Grassy Area Soil (0 - 30")
Post-Remediation Arsenic UCL

Raw Statistics	
Number of Valid Samples	90
Number of Unique Samples	43
Minimum	1.4
Maximum	229
Mean	12.5
Median	7.1
Standard Deviation	24.9
Variance	621.5
Coefficient of Variation	2.0
Skewness	7.7

Gamma Statistics	
k hat	1.4
k star (bias corrected)	1.4
Theta hat	8.8
Theta star	9.0
nu hat	256.9
nu star	249.7
Approx.Chi Square Value (.05)	214.1
Adjusted Level of Significance	0.0
Adjusted Chi Square Value	213.6

Log-transformed Statistics	
Minimum of log data	0.3
Maximum of log data	5.4
Mean of log data	2.1
Standard Deviation of log data	0.7
Variance of log data	0.5

RECOMMENDATION
Data are Non-parametric (0.05)

Use 95% Chebyshev (Mean, Sd) UCL

Normal Distribution Test
Lilliefors Test Statisitic
Lilliefors 5% Critical Value
Data not normal at 5% significance level

95% UCL (Assuming Normal Distrib
Student's-t UCL

Gamma Distribution Test
A-D Test Statistic
A-D 5% Critical Value
K-S Test Statistic
K-S 5% Critical Value
Data do not follow gamma distribution at 5% significance level

95% UCLs (Assuming Gamma Distribu
Approximate Gamma UCL
Adjusted Gamma UCL

Lognormal Distribution Test
Lilliefors Test Statisitic
Lilliefors 5% Critical Value
Data not lognormal at 5% significance le

95% UCLs (Assuming Lognormal Dis
95% H-UCL
95% Chebyshev (MVUE) UCL
97.5% Chebyshev (MVUE) UCL
99% Chebyshev (MVUE) UCL

95% Non-parametric UCLs
CLT UCL
Adj-CLT UCL (Adjusted for skewness)
Mod-t UCL (Adjusted for skewness)
Jackknife UCL
Standard Bootstrap UCL
Bootstrap-t UCL
Hall's Bootstrap UCL
Percentile Bootstrap UCL
BCA Bootstrap UCL
95% Chebyshev (Mean, Sd) UCL
97.5% Chebyshev (Mean, Sd) UCL
99% Chebyshev (Mean, Sd) UCL

Appendix E

NHANES 2000 Blood Lead Data

NHANES 2000 Data

The NHANES data for 1999-2000 was downloaded from the following website:

http://www.cdc.gov/nchs/about/major/nhanes/nhanes99_00.htm

The blood lead data are in the file: "Lab 06 Nutritional Biochemistries".
The demographic data are in the file: "Demographics".
The demographic and blood lead data were merged on the variable "SEQN".

Attached are the following documents:

- The SAS Code used to calculate the blood lead summary statistics from NHANES-2000
- The SAS output with the blood lead summary statistics
- Pages from the CDC NHANES-2000 Website

```
*======================================
Analyze blood lead data from NHANES-2000.
*======================================;

libname Datapath    'F:\Programs\RISK\NHANES\NHANES-2000\SD2 files';
        *path to read in data set;

libname Savepath    'F:\Programs\RISK\NHANES\NHANES-2000';
        *path to save permanent SAS data set;

*=====================================================================
VARIABLE DEFINITIONS
*=====================================================================

Sample number: SEQN
sex: RIAGENDR (1=male, 2=female)
age_yr: RIDAGEYR
age_mon: RIDAGEMN
exam weight: WTMEC2YR  Full Sample 2 Year Mec Exam Weight
interview weight:  WTINT2YR  Full Sample 2 Year Interview Weight


*============================================
Perform blood lead statistics.
*============================================;

Data Working; Set Datapath.Lab06d;


     *Define age groups;
        if      19 <= age_yr < 50       then age_grp = '19-49'  ;
        if      0 < age_yr < 7          then age_grp = '0-6'    ;
        if      7 <= age_yr < 13        then age_grp = '7-12'   ;
        if      13 <= age_yr < 19       then age_grp = '13-18'  ;
        if      50 <= age_yr            then age_grp = '50+'    ;

run;

Data Working; Set Working;

        PROC means VARDEF=weight noPrint;
                var PbB log_PbB;
                class age_grp gender ;
                weight WTMEC2YR;
                output out = Results
                        N = N log_N
                        mean = mean log_GM
                        std = SD log_GSD;
                title 'NHANES-2000 PbB Stats';
        run;

Data Results; set Results;

        GM = exp(log_GM);
        GSD = exp(log_GSD);

        PROC print;
                var age_grp gender N mean SD GM GSD;
        run;
```

SAS Output

NHANES-2000 PbB Stats 16:02 Thursday, March 24, 2005 1

OBS	AGE_GRP	GENDER	N	MEAN	SD	GM	GSD
1			7970	2.09853	2.07540	1.65531	1.93286
2		female	4057	1.70116	1.44955	1.37220	1.88815
3		male	3913	2.51036	2.50208	2.01050	1.86943
4	0-6		862	2.67822	2.46752	2.12546	1.91423
5	13-18		1595	1.27326	0.95252	1.06667	1.78400
6	19-49		2408	1.87129	1.81359	1.49421	1.88889
7	50+		2046	2.73395	2.51335	2.25231	1.80717
8	7-12		1059	1.77539	1.79584	1.44321	1.82163
9	0-6	female	385	2.82480	2.32853	2.23381	1.93548
10	0-6	male	477	2.55869	2.56914	2.04100	1.89139
11	13-18	female	788	0.99169	0.59784	0.86798	1.67908
12	13-18	male	807	1.55128	1.13785	1.30746	1.75652
13	19-49	female	1324	1.37407	1.00448	1.15761	1.76878
14	19-49	male	1084	2.39029	2.26752	1.95038	1.80418
15	50+	female	1042	2.24692	1.46971	1.92010	1.74077
16	50+	male	1004	3.30157	3.25008	2.71270	1.78529
17	7-12	female	518	1.67485	2.18416	1.32850	1.83900
18	7-12	male	541	1.86365	1.36074	1.55204	1.78897

National Center for Health Statistics
3311 Toledo Road
Hyattsville, MD 20782
(301) 458-4000
Toll Free Data Inquiries
1-866-441-NCHS

National Health and Nutrition Examination Survey

NHANES 1999-2000 Data Files

Data, Docs, Codebooks, SAS Code

Index

- Documentation
  - Analytic Guidelines
  - Contents of 1999-2000 Data Release (Updated March, 2005)
  - Description of Codebook Contents
  - NHANES 1999-2000 Data Release Frequently Asked Questions (FAQ)
  - General Data Release Documentation
  - Readme File
  - Release Notes
  - Weighting Notes
- Data
  - Demographics and Weighting Data, Codebooks, SAS Code
  - Examination Data, Docs, Codebooks, SAS Code
  - Laboratory Data, Codebooks, SAS Code, Sudan Code
  - Questionnaire Data, Codebooks, SAS Code

- **Release Notes**

NCHS releases public use data sets from the continuous NHANES in two year groupings (cycles). This release does not contain all of the data collected on persons who participated in the survey during those two years (9,965 persons). As more data becomes available it will be released on this webpage. These updates will be documented on this site. Data processing, methodologic and disclosure concerns are examples of the reasons why various data components from NHANES 1999-2000 are not on this first public use data release. When (and if) these concerns are resolved, the data will be made publicly available.

For a number of reasons, the release of data from the current

NHANES will not be comparable to the approach used in previous NHANES studies. The data and documentation for the interview, laboratory and examination components of the survey will be released in numerous files to facilitate ease of use and access via the Internet. This will require the user to merge files to create analytic data sets. In addition, changes in the survey design and implementation necessitate analytic guidelines that differ from previous NHANES. Many of the past general analytic principles still apply, but with adjustments for the new survey design and taking into account more recent statistical practices and procedures. The guidelines will be revised on various occasions as new issues are raised and addressed by NCHS staff. Users are encouraged to regularly check this site for updates on available data, documentation and guidelines for use of the data.

NHANES data in this release are in SAS transport file format. To access this data in any version of SAS, use the XPORT engine. It is recommended that you copy the transport files to a permanent SAS library. For example, assuming you have downloaded the Body Measures exam data to the folder "C:\NHANES", you can use the following SAS code to copy the Body Measures Exam Data:

```
LIBNAME XP XPORT "C:\NHANES\BMX.XPT";
PROC COPY IN=XP OUT=SASUSER;
RUN;
```

NHANES documentation and codebooks are in Adobe Acrobat PDF. If you do not have a current version of Acrobat Reader, a free copy may be obtained from the **Adobe web site**.

- **Demographics File** (NOTE: Clicking on the hyperlinks below will ftp self-extracting zip files. The zip files include the SAS transport file, codebook and documentation listed after each hyperlink.)
- **Demographics Variable List** **(Updated July, 2004)**
- **Demographics** [*Codebook, Doc, Freqs, Data*] **(Updated July, 2004)**

- **Examination Files** (NOTE: Clicking on the hyperlinks below will ftp self-extracting zip files. The zip files include the SAS transport file, codebook and documentation listed after each hyperlink. You can also download the codebook, documentation, frequencies or dataset for a particular examination component independently. The independent files are not zip files.)
- **General Documentation on Examination Data**
- **Variable List, SAS Code Example**
- **Audiometry** [**Subsample**] **(Updated March 2005)**
- **Balance** [**Subsample**] **(Updated March 2005)**
- **Bioelectrical Impedance Analysis** [*Codebook, Doc, Freqs, Data*]
- **Blood Pressure** [*Codebook, Doc, Freqs, Data*]
- **Body Measures** [*Codebook, Doc, Freqs, Data*]

- Cardiovascular Fitness [*Codebook*, *Doc*, *Freqs*, *Data*]
- Composite International Diagnostic Interview (Generalized Anxiety Disorder) [Subsample] **(Updated March 2005)**
- Composite International Diagnostic Interview (Major Depression Module) [Subsample] **(Updated March 2005)**
- Composite International Diagnostic (Interview Panic Disorder Module) [Subsample] **(Updated March 2005)**
- Dietary Interview (Individual Foods File) [*Codebook*, *Doc*, *Freqs*, *Formats*, *Format Doc*, *Data*) **(Updated May, 2004)**
- Dietary Interview (Total Nutrients) [*Codebook*, *Doc*, *Freqs*, *Data*] **(Updated May 2004)**
- Lower Extremity Disease (Ankle Brachial Blood Pressure Index) [*Codebook*, *Doc*, *Freqs*, *Data*]
- Lower Extremity Disease (Peripheral Neuropathy) [*Codebook*, *Doc*, *Freqs*, *Data*]
- Muscular Strength [*Codebook*, *Doc*, *Freqs*, *Data*]
- Oral Health (Dentition Section) [*Codebook*, *Doc*, *Freqs*, *Data*]
- Oral Health (Periodontal Section) [*Codebook*, *Doc*, *Freqs*, *Data*]
- Oral Health (Recommendation of Care/Referral Section [*Codebook*, *Doc*, *Freqs*, *Data*]
- Shared Exclusion Questions [*Codebook*, *Doc*, *Freqs*, *Data*]
- Vision Exam [*Codebook*, *Doc*, *Freqs*, *Data*] **(New)**

- **Laboratory Files** (NOTE: Clicking on the hyperlinks below will ftp self-extracting zip files. The zip files include the SAS transport file, codebook and documentation listed after each hyperlink. You can also download the codebook, documentation, frequencies or dataset for a particular examination component independently. The independent files are not zip files.)
- General Documentation on Laboratory Data
- Variable List, SAS Code Example, Sudan Code Example **(Updated March, 2005)**
- Laboratory Procedures Manuals **(New)**
- Phlebotomy [*Codebook*, *Doc*, *Freqs*, *Data*]
- PHPYPA Urinary Phthalates [Subsample]
- Urine Collection (Pregnancy) [*Codebook*, *Doc*, *Freqs*, *Data*]
- Lab 02 Hepatitis C [*Codebook*, *Doc*, *Freqs*, *Data*]
- Lab 03 Human Immunodeficiency Virus [*Codebook*, *Doc*, *Freqs*, *Data* **(Updated January, 2005)**
- Lab 05 Chlamydia and Gonorrhea [*Codebook*, *Doc*, *Freqs*, *Data*]
- Lab 06 Nutritional Biochemistries [*Codebook*, *Doc*, *Freqs*, *Data*] **(Data File updated June, 2004)** **Notice to Users**
- Lab 06HM Heavy Metals [Subsample] **(Updated August, 2004)**
- Lab 07 Latex [*Codebook*, *Doc*, *Freqs*, *Data*]

- Lab 09 Herpes I & II [*Codebook, Doc, Freqs, Data*] (Updated August, 2004)
- Lab 10 Glycohemoglobin [*Codebook, Doc, Freqs, Data*]
- Lab 10AM Plasma Glucose [Subsample] (Updated February, 2005)
- Lab 11 C-Reactive Protein [*Codebook, Doc, Freqs, Data*]
- Lab 13 Total Cholesterol [*Codebook, Doc, Freqs, Data*] (Updated September, 2003)
- Lab 13AM Triglycerides [Subsample] (Updated February, 2005)
- Lab 16 Urinary Albumin and Creatinine [*Codebook, Doc, Freqs, Data*]
- Lab 17 Cryptosporidum and Toxoplasma [*Codebook, Doc, Freqs, Data*]
- Lab 18 Biochemistry Profile and Hormones [*Codebook, Doc, Freqs, Data*] (Data File updated February, 2003)
- Lab 18T4 Thyroid-Stimulating Hormone and Thyroxine [Subsample] (New)
- Lab 19 Measles, Rubella, and Varicella [*Codebook, Doc, Freqs, Data*] (Updated January, 2005)
- Lab 22 Hair Mercury [*Codebook, Doc Freqs, Data*] (Updated February, 2005)
- Lab 25 Complete Blood Count [*Codebook, Doc, Freqs, Data*] (Updated August, 2004)
- Lab 26 Pesticides [Subsample]
- Lab 28 Dioxins [Subsample]

- **Questionnaire Files** (NOTE: Clicking on the hyperlinks below will ftp self-extracting zip files.. The zip files include the SAS transport file, codebook and documentation listed after each hyperlink. You can also download the codebook, documentation, frequencies or dataset for a particular examination component independently. The independent files are not zip files.)
- General Documentation on Questionnaire Data
- Variable List, SAS Code Example (Updated March, 2005)
- Acculturation [*Codebook, Doc, Freqs, Data*]
- Alcohol Use [*Codebook, Doc, Freqs, Data*]
- Audiometry [*Codebook, Doc, Freqs, Data*]
- Balance [*Codebook, Doc, Freqs, Data*]
- Blood Pressure [*Codebook, Doc, Freqs, Data*]
- Cardiovascular Disease and Health [*Codebook, Doc, Freqs,Data*]
- Cognitive Functioning [*Codebook, Doc, Freqs, Data*] (New)
- Current Health Status [*Codebook, Doc, Freqs, Data*]
- Dermatology [*Codebook, Doc, Freqs, Data*]
- Diabetes [*Codebook, Doc, Freqs, Data*]
- Diet Behavior & Alcohol Consumption [*Codebook, Doc, Freqs, Data*] (Updated September, 2003)
- Dietary Supplement Use [*DSQ Readme, Doc,*

Data] (Updated October, 2004)

- File 1: Supplement Counts [Codebook, Freqs, Data]
- File 2: Participant's Use of Supplement [Codebook, Freqs]
- File 3: Supplement Information [Codebook, Freqs]
- File 4: Ingredient Information [Codebook, Freqs]
- File 5: Supplement Blend [Codebook, Freqs]

- Drug Use [Codebook, Doc, Freqs, Data]
- Early Childhood [Codebook, Doc, Freqs, Data]
- Family Smoking [Codebook, Doc, Freqs, Data] (New)
- Food Security [Codebook, Doc, Freqs, Data] (New)
- Health Insurance [Codebook, Doc, Freqs, Data] (New)
- Hospital Utilization [Codebook, Doc, Freqs, Data]
- Housing Characteristics [Codebook, Doc, Freqs, Data] (New)
- Immunization [Codebook, Doc, Freqs, Data]
- Kidney Conditions [Codebook, Doc, Freqs, Data]
- Medical Conditions [Codebook, Doc, Freqs, Data]
- Miscellaneous Pain [Codebook, Doc, Freqs, Data]
- Occupation [Codebook, Doc, Freqs, Data]
- Oral Health [Codebook, Doc, Freqs, Data]
- Osteoporosis [Codebook, Doc, Freqs, Data]
- Analgesics Pain Relievers [Codebook, Doc, Freqs, Data]
- Pesticide Use [Codebook, Doc, Freqs, Data] (New)
- Physical Activity [Codebook, Doc, Freqs, Data] (Revised September 2004)
- Physical Activity Individual Activities File [Codebook, Doc, Freqs, Data] (New)
- Physical Functioning [Codebook, Doc, Freqs, Data]
- Prescription Medications [Codebook, Doc, Freqs, Data]
- Reproductive Health [Codebook, Doc, Freqs, Data] (Revised September 2004)
- Respiratory Health/Disease [Codebook, Doc, Freqs, Data]
- Sexual Behavior [Codebook, Doc, Freqs, Data]
- Smoking and Tobacco Use (MEC) [Codebook, Doc, Freqs, Data]
- Smoking and Tobacco Use [Codebook, Doc, Freqs, Data] (Data File Updated February 2003)
- Social Support [Codebook, Doc, Freqs, Data]
- Tuberculosis [Codebook, Doc, Freqs, Data]
- Vision [Codebook, Doc, Freqs, Data] (New)
- Weight History [Codebook, Doc, Freqs, Data]

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This page last reviewed March 28, 2005

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Center for Health Statistics
Hyattsville, MD
20782

(301) 458-4000

APPENDIX B

January 2007 Soil and Groundwater Data Validation Reports

DATA VALIDATION REPORT

OF

SOIL AND GROUNDWATER SAMPLES

COLLECTED ON JANUARY 22-25, 2007

FOR

INORGANIC AND CONVENTIONAL ANALYSES

Sample Delivery Group No. 07012310, 0701324, 0701330, 0701343, 0701349, 0701350, 0701366, 0701376, 0702044, and 0702174

PREPARED FOR:

Refined Metals Corporation
Beech Grove, Indiana

PREPARED BY:

ADVANCED GEOSERVICES CORP.
WEST CHESTER, PENNSYLVANIA

March 27, 2007
Project Number 2003-1046-09

DATA VALIDATION REPORT
INORGANICS

INTRODUCTION

This data validation report addresses the inorganic results from groundwater and soil samples collected January 22-25, 2007, as part of the RMC Beech Grove, Indiana, Citizens Gas January 2007 sampling event. The groundwater samples were analyzed by Trimatrix in Grand Rapids, Michigan for antimony, arsenic, lead, and manganese by USEPA SW-846 method 6020A, and calcium, iron, magnesium and sodium by USEPA SW-846 method 6010A. The data were reported by Trimatrix under sample delivery group (SDG) 07012310, 0701324, 0701343, and 0701366. The soil samples were analyzed by Trimatrix in Grand Rapids, Michigan for antimony, arsenic, cadmium, chromium, lead and selenium by USEPA SW-846 method 6020A, and arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver by USEPA SW-846 method 7470A and 6020A. The data were reported by Trimatrix under sample delivery group (SDG) 0701330, 0701349, 0701350, 0701376, 0702044, and 0702174.

This review has been performed with guidance from the Indiana Department of Environmental Management's Guidance to the Performance and Presentation of Analytical Chemistry Data (July 1998) and the U.S. EPA's National Functional Guideline for Inorganic Data Review (Feb. 1994). The findings presented in this report are based upon a review of all data supplied by the laboratory.

1. Timeliness

All samples were prepared and analyzed within holding time limits of 6 months.

2. Sample Preparation

All sample preparation procedures were in accordance with the method protocols.

3. Calibration

The instruments were standardized according to the analytical method using one blank and a single calibration standard for each element. All calibrations (ICVs) were performed as required and met the criteria for acceptance.

4. Reference Control Samples/Calibration Verification

Reference control samples (CCVs) are digested and analyzed along with the samples to verify the efficiency of laboratory procedures. All recoveries met the acceptance criteria for control samples.

5. Blanks

Total iron was detected in the method blank (0700868-BLK1) associated samples EB-1-012207, EB-3-012307, EB-5-012407, and EB-7-0125-07 were qualified (U) for total iron.

Dissolved iron was detected in equipment blank (EB-7-0125-07) associated sample MW-11 was qualified (U) for dissolved iron.

Total lead was detected in the equipment blank (EB-3-012307) associated samples MW-12, MW-1, MW-6D, MW-10, and MW-6D-D were qualified (U) for total lead.

Total antimony was detected in equipment blank (EB-5-012407) associated sample MW-4 was qualified (U) for total antimony.

Silver, SPLP, was detected in the continuing calibration blank (7020608-CCB1) associated sample CSB-33-F was qualified (U) for silver.

Arsenic, SPLP, was detected in the method blank (0700930-BLK1) associated samples CDB-28-E, CSB-11-F, and CSB-3-G were qualified (U) for arsenic.

Selenium was detected in the continuing calibration blank (7013057-CCB2) and equipment blank (EB-6-012507). Associated sample CSB-2-E for continuing calibration blank (7013057-CCB2; and CSB-2-D, CSB-2-E, CSB-2-F, and CSB-2-F-D were qualified (U) for selenium.

Antimony was detected in the method blank (0701224-BLK1), equipment blank (EB-2-012307), equipment blank (EB-4-012407), and equipment blank (EB-6-012507). Associated samples CSB-10-M and CSB-2-H for method blank (0701224-BLK1); CSB-10-J, SCB-10-K, CSB-10-K-D, CSB-12-F, CSB-10-M, and CSB-12-K for equipment blank (EB-2-012307); CSB-38-A-F, CSB-38A-G, CSB-33-F, CSB-33-F-D, CSB-51-H, CSB-51-I, and CSB-51-J for (EB-4-012407); and CSB-11-E, CSB-11-F, CSB-2-E, CSB-2-F, CSB-2-F-D, CSB-2-G, AND CSB-2-H for equipment blank (EB-6-012507) were qualified (U) for antimony.

Cadmium was detected in equipment blank (EB-2-012307), equipment blank (EB-4-012407), and equipment blank (EB-6-012507). Associated samples CSB-10-K, CSB-10-K-D, RSB-26-C, and RSB-26-D for equipment blank (EB-2-012307); RSB-78-E, RSB-78-F, and RSB-78-E-D for

6. Duplicate Analysis

The relative percent differences (RPDs) were within the laboratory control limits.

7. Field Duplicates

Sample MW-6D/MW-6D-D, MW-5/MW-5-D, and CSB-33-F/CSB-33-F-D were field duplicates. Relative percent differences (RPD) were calculated when both concentrations were greater than five times the reporting limit (RL); otherwise, the difference between the two concentrations was calculated. The criteria of 25% RPD or 1.5 x RL for aqueous and 40% RPD or 2.5 x RL for solid samples were applied.

8. Matrix Spike Analysis

The matrix spike (MS) percent recoveries were within the QC limits of 80-120 percent (aqueous matrices), with the exception of the following:

Parameter	%R	MS or MSD	Associated Samples
Sulfate	74%	MS	MW-2D
Sulfate	73%	MSD	MW-2D

The associated sample results and reporting limits were qualified as estimated (J/UJ) when the %R was less than the lower QC limit.

9. Laboratory Control Sample (LCS)

The laboratory control sample (LCS) percent recoveries were within the QC limits of 80-120 percent.

10. Additional comments

MW-6 sulfide bottle broke during transport to the laboratory, the well was not re-sampled.

DATA VALIDATION REPORT
VALIDATION SUMMARY

SUMMARY

All the data is useable as qualified.

DATA QUALIFIERS

The following qualifiers were used to modify the data quality and usefulness of individual analytical results.

- U - The analyte was not detected at the given quantitation limit.
- J - The analyte was positively identified and detected; however, the concentration is an estimated value because the result is less than the quantitation limit or quality control criteria were not met.
- UJ - The analyte was not detected; the associated quantitation limit is an estimated value.
- D - The value was obtained from a reanalysis of a diluted sample.
- E - Concentration reported is estimated, the concentration exceeded the instrument's calibration range. The sample should be diluted.
- R - The value reported has been rejected.

DATA ASSESSMENT

Data review was performed by an experienced quality assurance scientist independent of the analytical laboratory and not directly involved in the project.

This is to certify that I have examined the analytical data and based on the information provided to me by the laboratory, in my professional judgment the data are acceptable for use except where qualified with qualifiers which modify the usefulness of those individual values.

Erica N Nicholson 3.27.07
Quality Assurance Scientist Date

Jeff M. Stacy 3/27/2007
Quality Assurance Manager Date

TABLES

RMC Beechgrove
1/2007 Soil Sampling
Trimatrix #0701350 - 0701376, Project #2003-1046

Sample Location		CSB-33-F			CSB-33-F-D			CSB-33-N			CSB-33-N-D			CSB-28-I			CSB-28-E		
Lab ID		0701350-01			0701350-02			0701350-03			0701350-04			0701350-05			0701350-06		
Sample Date		1/24/07			1/24/07			1/24/07			1/24/07			1/24/07			1/24/07		
Matrix		Soil			Soil			Soil			Soil			Soil			Soil		
Remarks					FD of CSB-33B-F						FD of CSB-33B-N								
Parameter	**Units**	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**
SPLP Metals																			
Arsenic	mg/L	0.0034		0.001	0.0034		0.001		NA			NA			NA		0.0023	U	0.001
Barium	mg/L	0.19		0.001	0.1		0.001		NA			NA			NA		0.23		0.001
Cadmium	mg/L	0.0001	J	0.0002	0.00012	J	0.0002		NA			NA			NA		0.000065	J	0.0002
Chromium	mg/L	0.008		0.001	0.0059		0.001		NA			NA			NA		0.0053		0.001
Lead	mg/L	0.0048		0.001	0.0094		0.001		NA			NA			NA		0.0079		0.001
Mercury	mg/L		U	0.0002		U	0.0002		NA			NA			NA			U	0.0002
Selenium	mg/L	0.001		0.001		U	0.001		NA			NA			NA		0.001		0.001
Silver	mg/L	0.000089	U	0.0002		U	0.0002		NA			NA			NA			U	0.0002
Conventionals																			
Bulk Density	g/mL		NA			NA		1.88		0.01	1.66		0.01	1.68		0.01		NA	
Percent Moisture	% wet		NA			NA		9.8		0.1	9.8		0.1	11		0.1		NA	
pH	pH Units		NA			NA		7.5		1	8		1	8.6		1		NA	

QA Scientist [signature] Date 3/12/2007

RMC Beechgrove
1/2007 Soil Sampling
Trimatrix #0701350 - 0701376, Project #2003-1046

Sample Location		CSB-11-F			CSB-11-R			CSB-3-N			CSB-3-G		
Lab ID		0701376-01			0701376-02			0701376-03			0701376-04		
Sample Date		1/25/07			1/25/07			1/25/07			1/25/07		
Matrix		Soil			Soil			Soil			Soil		
Remarks													
Parameter	***Units***	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**
SPLP Metals													
Arsenic	mg/L	0.0012	U	0.001		NA			NA		0.002	U	0.001
Barium	mg/L	0.024		0.001		NA			NA		0.024		0.001
Cadmium	mg/L		U	0.0002		NA			NA		0.000076	J	0.0002
Chromium	mg/L	0.0023		0.001		NA			NA		0.0037		0.001
Lead	mg/L	0.0026		0.001		NA			NA		0.012		0.001
Mercury	mg/L		U	0.0002		NA			NA			U	0.0002
Selenium	mg/L	0.0009	J	0.001		NA			NA		0.00099	J	0.001
Silver	mg/L		U	0.0002		NA			NA			U	0.0002
Conventionals													
Bulk Density	g/mL		NA		1.66		0.01	1.41		0.01		NA	
Percent Moisture	% wet		NA		14		0.1	11		0.1		NA	
pH	pH Units		NA		7.8		1	8.1		1		NA	

QA Scientist [signature] Date 3/12/2[illegible]

RMC Beechgrove
1/2007 Soil Sampling
Trimatrix #0701330, 0701349, 0701365, 0702044, and 0702174, Project #2003-1046

Sample Location		RSB-17-C			RSB-17-D			CSB-10-J			CSB-10-K			CSB-10-L			CSB-10-K-D			CSB-12-D			CSB-12-E			CSB-12-F		
Lab ID		0701330-01			0701330-02			0701330-03			0701330-04			0701330-05			0701330-06			0701330-07			0701330-08			0701330-09		
Sample Date		1/23/2007			1/23/2007			1/23/2007			1/23/2007			1/23/2007			1/23/2007			1/23/2007			1/23/2007			1/23/2007		
Matrix		Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil		
Remarks																	FD of CSB-10-K											
Parameter	Units	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL
Total Metals																												
Antimony	mg/kg		NA			NA		0.9	U	0.3	0.58	U	0.3	20		0.3	2.6	U	0.3	8100		120	940		12	14	U	0.3
Arsenic	mg/kg	290		1	24		0.1	13		0.1	5.8		0.1	6.7		0.1	6.4		0.1	970		5	200		1	14		0.1
Cadmium	mg/kg	67		0.4	230		2	1.2		0.2	0.34	U	0.2	0.6		0.2	0.35	U	0.2		NA			NA			NA	
Chromium	mg/kg		NA			NA			NA			NA			NA			NA			NA			NA			NA	
Lead	mg/kg		NA			NA			NA			NA			NA			NA			NA			NA			NA	
Selenium	mg/kg		NA			NA			NA			NA			NA			NA			NA			NA			NA	

Sample Location		RSB-26-C			RSB-26-D			EB-2-012307			CSB-38-D			CSB-38-E			CSB-38-F			CSB-38A-F			CSB-38A-G			CSB-33-D		
Lab ID		0701330-10			0701330-11			0701330-12			0701349-01			0701349-02			0701349-03			0701349-04			0701349-05			0701349-06		
Sample Date		1/23/2007			1/23/2007			1/23/2007			1/24/2007			1/24/2007			1/24/2007			1/24/2007			1/24/2007			1/24/2007		
Matrix		Soil			Soil			Aqueous			Soil			Soil			Soil			Soil			Soil			Soil		
Remarks								Equipment Blank (ug/L)																				
Parameter	Units	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL
Total Metals																												
Antimony	mg/kg		NA			NA		6.1		1		NA			NA			NA		1.2	U	0.3	1.6	U	0.3		NA	
Arsenic	mg/kg	9.8		0.1	10		0.1	1.5		1	7.7		0.1	6.3		0.1	6.8		0.1	7.9		0.1	9.5		0.1	8.9		0.1
Cadmium	mg/kg	0.22	U	0.2	0.38	U	0.2	0.2		0.2		NA			NA			NA			NA			NA			NA	
Chromium	mg/kg		NA			NA			NA		15		2	10		2	12		2		NA			NA			NA	
Lead	mg/kg	24	U	1	22	U	1	240		1		NA			NA			NA			NA			NA			NA	
Selenium	mg/kg		NA			NA			NA			NA			NA			NA			NA			NA			NA	

Sample Location		CSB-33-E			CSB-33-F			CSB-33-F-D			RSB-75-E			RSB-75-F			CSB-51-H			CSB-51-I			CSB-51-J			RSB-78-E		
Lab ID		0701349-07			0701349-08			0701349-09			0701349-10			0701349-11			0701349-12			0701349-13			0701349-14			0701349-15		
Sample Date		1/24/2007			1/24/2007			1/24/2007			1/24/2007			1/24/2007			1/24/2007			1/24/2007			1/24/2007			1/24/2007		
Matrix		Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil			Soil		
Remarks								FD of CSB-33-F																				
Parameter	Units	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL
Total Metals																												
Antimony	mg/kg		NA		0.76	U	0.3	0.81	U	0.3		NA			NA		1.1	U	0.3	1.3	U	0.3	0.88	U	0.3		NA	
Arsenic	mg/kg	7.1		0.1	7.3	J	0.1	11	J	0.1	7.5		0.1	6.6		0.1	7		0.1	9.6		0.1	7.2		0.1	5.7		0.1
Cadmium	mg/kg		NA			NA			NA			NA			NA			NA			NA			NA		0.61	U	0.2
Chromium	mg/kg		NA			NA			NA			NA			NA			NA			NA			NA			NA	
Lead	mg/kg		NA		18	U	1	19	U	1	14	U	1	8.7	U	1	16	U	1	15	U	1	12	U	1	110	U	5
Selenium	mg/kg		NA			NA			NA			NA			NA			NA			NA			NA			NA	

\\Gaea\sys\OFICEAGC\COMMON\QA\RMC Beech Grove\DataVal\2007 Sampling\0701330-2174 TABLE

QA Scientist Erica Nicholson Date 3-12-07

RMC Beechgrove
1/2007 Soil Sampling
Trimatrix #0701330, 0701349, 0701365, 0702044, and 0702174, Project #2003-1046

Sample Location		RSB-78-F			RSB-78-E-D			EB-4-012407			CSB-28-D			CSB-28-E			CSB-11-D			CSB-11-E			CSB-11-F			CSB-2-D		
Lab ID		0701349-16			0701349-17			0701349-18			0701349-19			0701349-20			0701365-01			0701365-02			0701365-03			0701365-04		
Sample Date		1/24/2007			1/24/2007			1/24/2007			1/24/2007			1/24/2007			1/25/2007			1/25/2007			1/25/2007			1/25/2007		
Matrix		Soil			Soil			Aqueous			Soil			Soil			Soil			Soil			Soil			Soil		
Remarks					FD of RSB-78-E			Equipment Blank (ug/L)																				
Parameter	Units	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL
Total Metals																												
Antimony	mg/kg		NA			NA		7.7		1		NA			NA		810	J	12	5	UJ	0.3	1.2	UJ	0.3	890	J	12
Arsenic	mg/kg	7.8		0.1	6.6		0.1	0.94	J	1	8.2		0.1	13		0.1	680	J	2	8.2	UJ	0.1	6.8	UJ	0.1	180	UJ	0.5
Cadmium	mg/kg	0.45	U	0.2	0.56	U	0.2	0.79		0.2		NA			NA			NA			NA			NA		32	U	0.2
Chromium	mg/kg		NA			NA		2		1	24		2	21		2		NA			NA			NA				
Lead	mg/kg	88	U	5	96	U	5	330		1		NA		15	U	1	58000	U	2000	280	U	10	43	U	2	72000	U	2000
Selenium	mg/kg		NA			NA			NA			NA			NA			NA			NA			NA		9.3	UJ	0.2

Sample Location		CSB-2-E			CSB-2-F			CSB-2-F-D			CSB-3-F			CSB-3-G			EB-6-012507			RSB-17-E			RSB-17-F			CSB-12-H		
Lab ID		0701365-05			0701365-06			0701365-07			0701365-08			0701365-09			0701365-10			0702044-01			0702044-02			0702044-03		
Sample Date		1/25/2007			1/25/2007			1/25/2007			1/25/2007			1/25/2007			1/25/2007			1/23/2007			1/23/2007			1/23/2007		
Matrix		Soil			Soil			Soil			Soil			Soil			Aqueous			Soil			Soil			Soil		
Remarks								FD of CSB-2-F									Equipment Blank (ug/L)											
Parameter	Units	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL
Total Metals																												
Antimony	mg/kg	9.6	UJ	0.3	8.4	UJ	0.3	11	UJ	0.3		NA			NA		94		1		NA			NA		190		1.5
Arsenic	mg/kg	13	UJ	0.1	11	UJ	0.1	10	UJ	0.1	6.4	UJ	0.1	4.4	UJ	0.1	89		1	43		0.1	6		0.1	22		0.1
Cadmium	mg/kg	0.38	U	0.2	0.72	U	0.2	0.67	U	0.2		NA			NA		25		0.2	140		1	0.54		0.2		NA	
Chromium	mg/kg											NA			NA			NA			NA			NA			NA	
Lead	mg/kg	750	UJ	20	820	U	20	890	U	20		NA		65	U	2	33000		100		NA			NA			NA	
Selenium	mg/kg	0.42	UJ	0.2	0.61	UJ	0.2	0.5	UJ	0.2		NA			NA		8.8		1		NA			NA			NA	

Sample Location		CSB-10-M			CSB-12-G			CSB-2-G			CSB-2-H			CSB-12-I			CSB-12-J			CSB-12-K		
Lab ID		0702044-04			0702044-05			0702044-06			0702044-07			0702174-01			0702174-02			0702174-03		
Sample Date		1/23/2007			1/23/2007			1/25/2007			1/25/2007			1/23/2007			1/23/2007			1/23/2007		
Matrix		Soil			Soil			Soil			Soil			Soil			Soil			Soil		
Remarks																						
Parameter	Units	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL	Result	Q	RL
Total Metals																						
Antimony	mg/kg	0.95	U	0.3	43		0.3	23	U	0.3	0.81	U	0.3	180	J	3	63	J	0.6	1.6	UJ	0.3
Arsenic	mg/kg				7.2		0.1		NA			NA		13		0.1	14		0.1	8.4		0.1
Cadmium	mg/kg					NA			NA			NA			NA			NA			NA	
Chromium	mg/kg					NA			NA			NA			NA			NA			NA	
Lead	mg/kg					NA		1900		100	18		1		NA			NA			NA	
Selenium	mg/kg					NA			NA			NA			NA			NA			NA	

QA Scientist [illegible] Date 3 12

Report Number
07-052-2111

Midwest Laboratories, Inc.

13611 "B" Street • Omaha, Nebraska 68144-3693 • (402) 334-7770 • FAX (402) 334-9121
www.midwestlabs.com

REPORT OF ANALYSIS

For: (10652) TRIMATRIX LABORATORIES INC
(616)975-4500

Mail to:

TRIMATRIX LABORATORIES INC
5560 CORPORATE EXCHANGE CT
GRAND RAPIDS MI 49512-

Date Reported: 02/21/07
Date Received: 02/16/07
Date Sampled: 01/25/07

BEECH GROVE

Lab number: 1269165 Sample ID: CSB-11-R

Analysis	Level Found	Units	Detection Limit	Method	Analyst-Date	Verified-Date

Respectfully Submitted

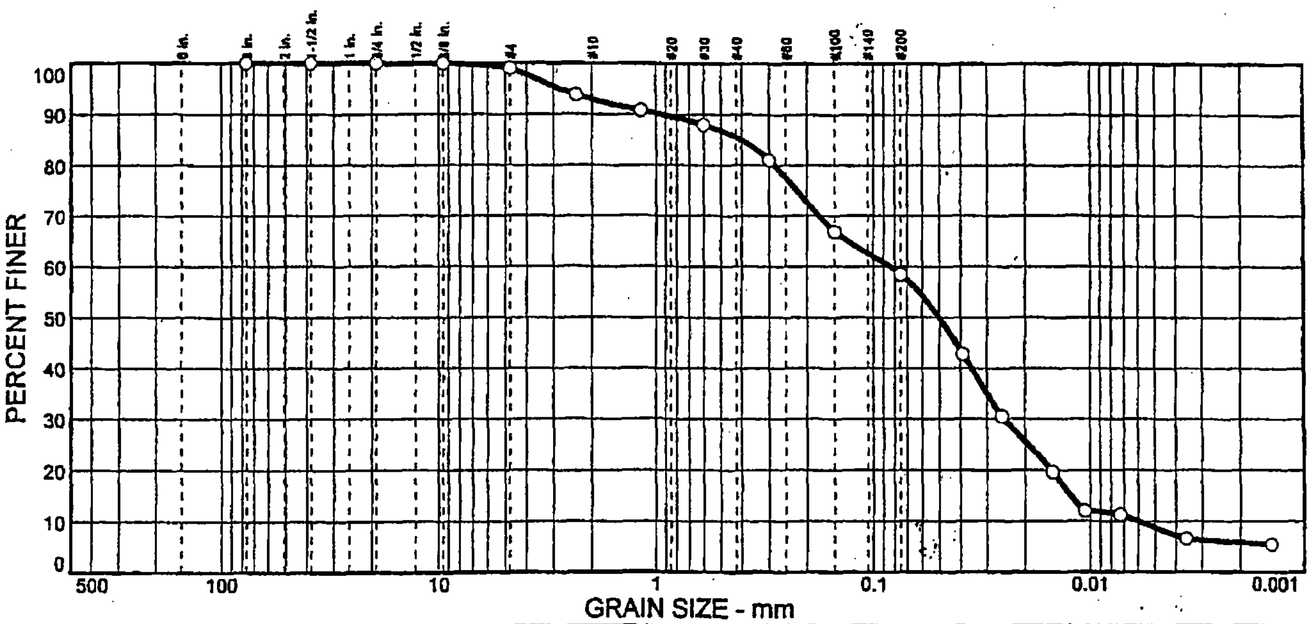
Heather Ramig/Sue Ann Seitz/Rob Ferris
Prem Arora/Client Services

Midwest Laboratories, Inc.
13611 B Street • Omaha, Nebraska 68144-3693 • (402) 334-7770 • FAX (402) 334-9121 • www.midwestlabs.com

Particle Size Distribution Report

Project: BEECH GROVE **Report No.:** 07-052-2111
Client: TRIMATRIX LABORATORIES INC

Sample No: 1269165 **Source of Sample:** **Date:** 01/25/2007
Location: CSB-11-R **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.0	6.1	7.3	27.2	49.7	8.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	99.0		
#8	93.8		
#16	90.8		
#30	88.0		
#50	81.0		
#100	66.8		
#200	58.4		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.401 D_{60}= 0.0842 D_{50}= 0.0503
D_{30}= 0.0251 D_{15}= 0.0124 D_{10}= 0.0060
C_u= 14.05 C_c= 1.25

Classification

USCS= AASHTO=

Remarks

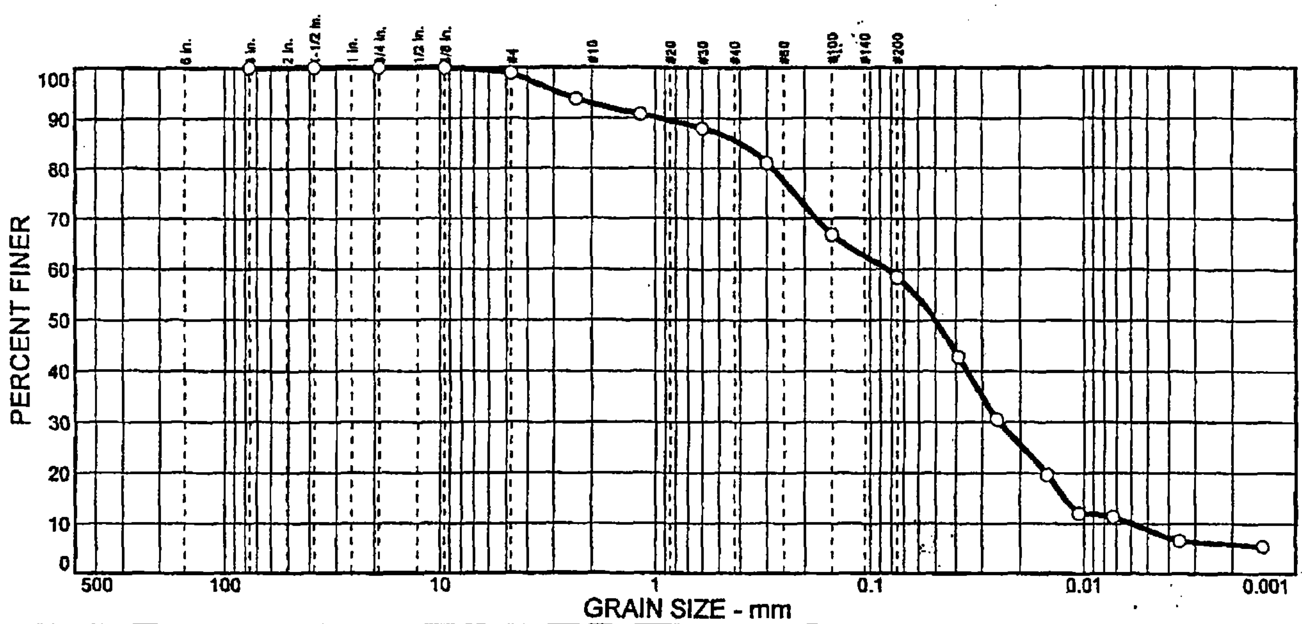
Figure

Midwest Laboratories, Inc.
13611 B Street • Omaha, Nebraska 68144-3693 • (402) 334-7770 • FAX (402) 334-9121 • www.midwestlabs.com

Particle Size Distribution Report

Project: BEECH GROVE **Report No.:** 07-052-2111
Client: TRIMATRIX LABORATORIES INC

Sample No: 1269165 **Source of Sample:** **Date:** 01/25/2007
Location: CSB-11-R **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.0	6.1	7.3	27.2	49.7	8.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	99.0		
#8	93.8		
#16	90.8		
#30	88.0		
#50	81.0		
#100	66.8		
#200	58.4		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.401 D_{60}= 0.0842 D_{50}= 0.0503
D_{30}= 0.0251 D_{15}= 0.0124 D_{10}= 0.0060
C_u= 14.05 C_c= 1.25

Classification

USCS= AASHTO=

Remarks

Figure

Midwest Laboratories, Inc.

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www.midwestlabs.com

Report Number
07-052-2110

25255

REPORT OF ANALYSIS

For: (10652) TRIMATRIX LABORATORIES INC
(616)975-4500

Mail to:

TRIMATRIX LABORATORIES INC
5560 CORPORATE EXCHANGE CT
GRAND RAPIDS MI 49512-

Date Reported: 02/21/07
Date Received: 02/16/07
Date Sampled: 01/24/07

BEECH GROVE

Lab number: 1269164 Sample ID: CSB-28-I

Analysis	Level Found	Units	Detection Limit	Method	Analyst-Date	Verified-Date

Respectfully Submitted

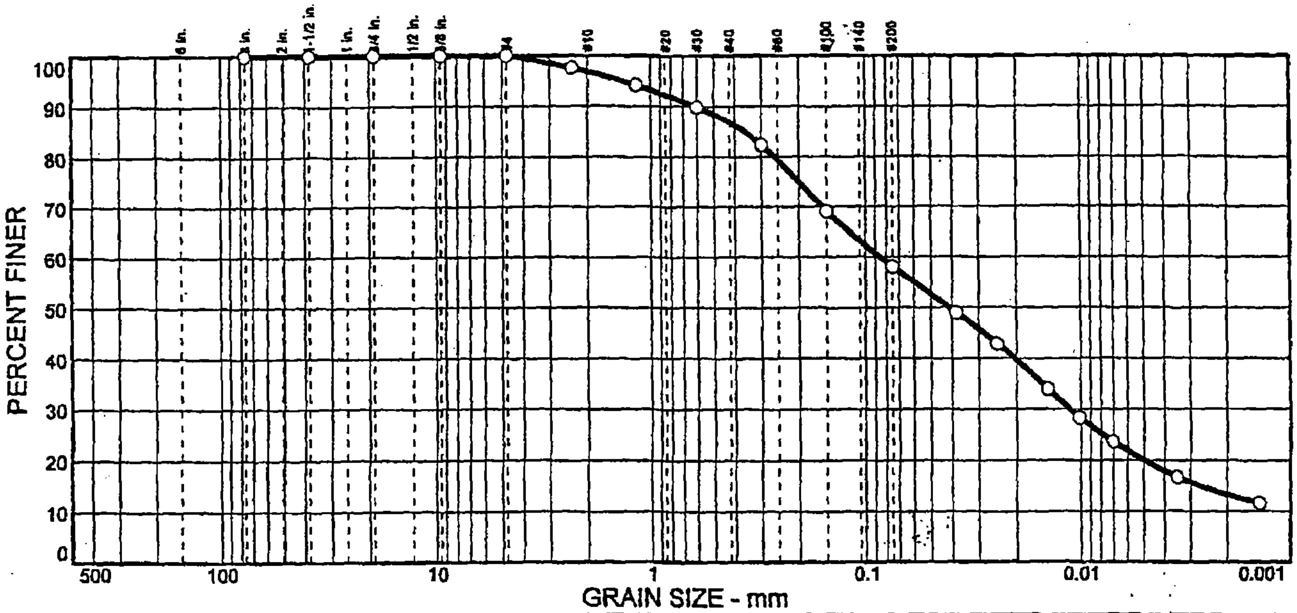
Heather Ramig/Sue Ann Seitz/Rob Ferris
Prem Arora/Client Services

Midwest Laboratories, Inc.
13611 B Street • Omaha, Nebraska 68144-3693 • (402) 334-7770 • FAX (402) 334-9121 • www.midwestlabs.com

Particle Size Distribution Report

Project: BEECH GROVE **Report No.:** 07-052-2110
Client: TRIMATRIX LABORATORIES INC

Sample No: 1269164 **Source of Sample:** **Date:** 01/24/2007
Location: CSB-28-I **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	3.1	10.0	28.9	38.1	19.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	97.6		
#16	94.2		
#30	89.8		
#50	82.4		
#100	69.0		
#200	58.0		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.361 D_{60}= 0.0864 D_{50}= 0.0415
D_{30}= 0.0113 D_{15}= 0.0027 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Figure

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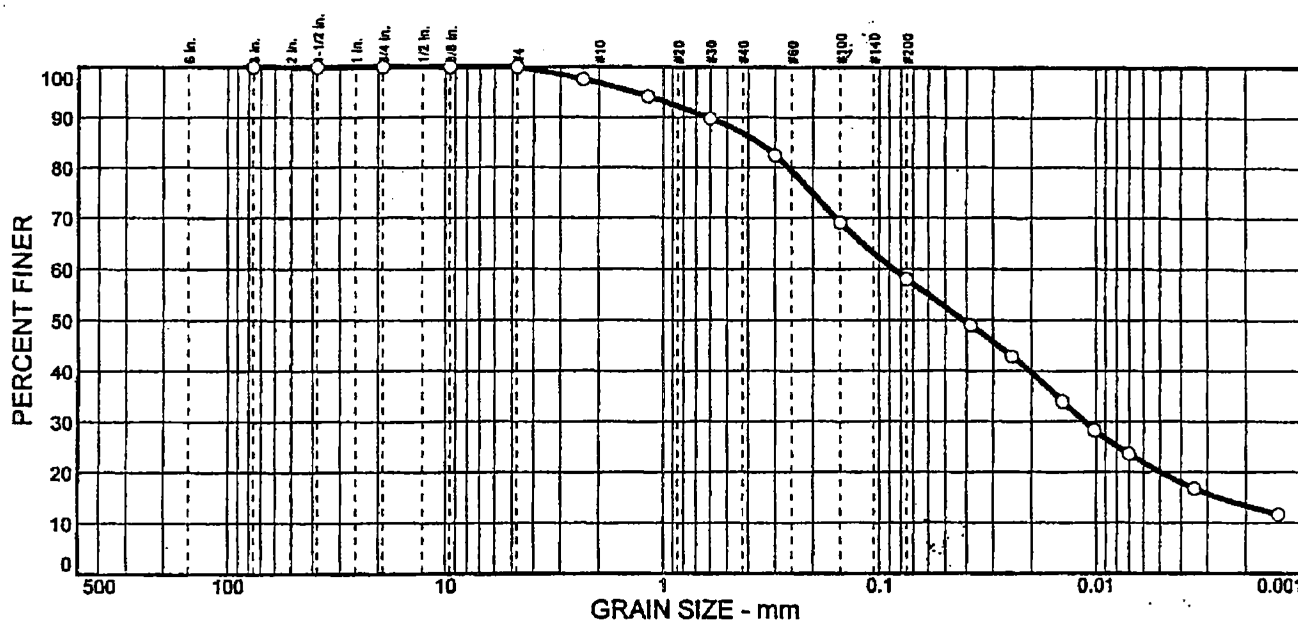
Particle Size Distribution Report

Project: BEECH GROVE **Report No.:** 07-052-2110
Client: TRIMATRIX LABORATORIES INC

Sample No: 1269164 **Source of Sample:** **Date:** 01/24/2007
Location: CSB-28-I **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	3.1	10.0	28.9	38.1	19.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	97.6		
#16	94.2		
#30	89.8		
#50	82.4		
#100	69.0		
#200	58.0		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.361 D_{60}= 0.0864 D_{50}= 0.0415
D_{30}= 0.0113 D_{15}= 0.0027 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Figure

Report Number
07-052-2109

Midwest Laboratories, Inc.

13611 "B" Street • Omaha, Nebraska 68144-3693 • (402) 334-7770 • FAX (402) 334-9121
www.midwestlabs.com

REPORT OF ANALYSIS

For: (10652) TRIMATRIX LABORATORIES INC
(616)975-4500

Mail to:

TRIMATRIX LABORATORIES INC
5560 CORPORATE EXCHANGE CT
GRAND RAPIDS MI 49512-

Date Reported: 02/21/07
Date Received: 02/16/07
Date Sampled: 01/24/07

BEECH GROVE

Lab number: 1269163 Sample ID: CSB-33-N DUP

Analysis	Level Found	Units	Detection Limit	Method	Analyst-Date	Verified-Date

Respectfully Submitted

Heather Ramig/Sue Ann Seitz/Rob Ferris
Prem Arora/Client Services

Midwest Laboratories, Inc.

13611 B Street • Omaha, Nebraska 68144-3693 • (402) 334-7770 • FAX (402) 334-9121 • www.midwestlabs.com

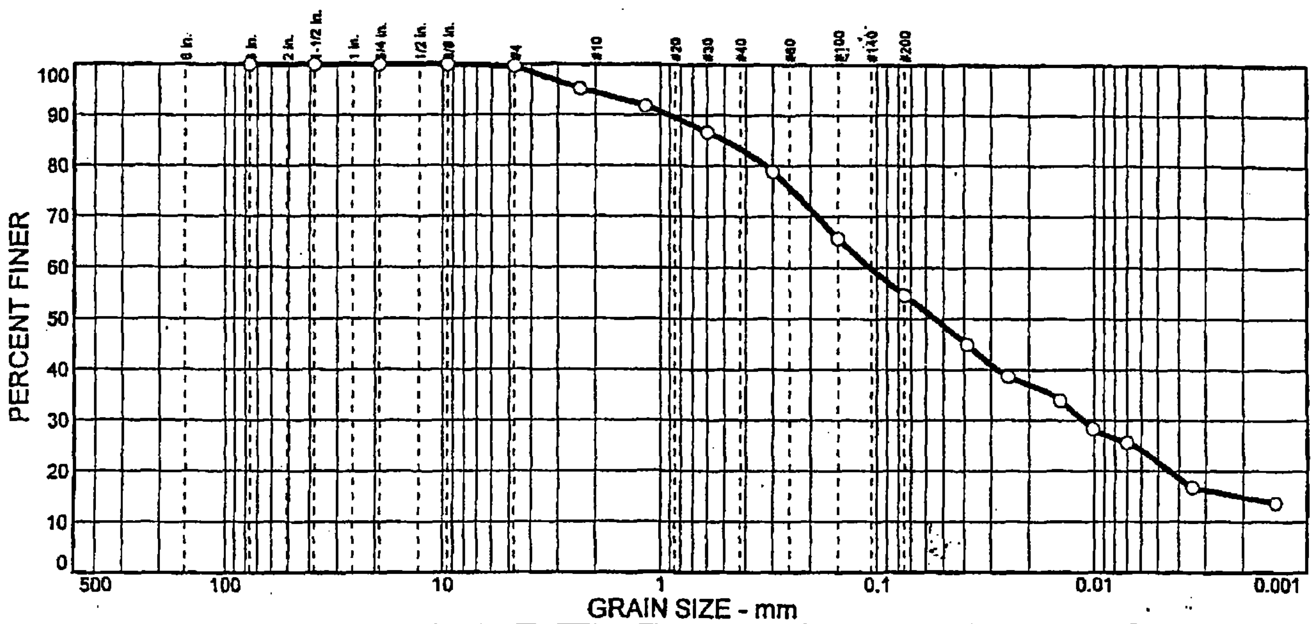
Particle Size Distribution Report

Project: BEECH GROVE **Report No.:** 07-052-2109

Client: TRIMATRIX LABORATORIES INC

Sample No: 1269163 **Source of Sample:** **Date:** 01/24/2007

Location: CSB-33-N DUP **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.4	5.2	11.1	28.7	33.0	21.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	99.6		
#8	95.2		
#16	91.8		
#30	86.6		
#50	78.8		
#100	65.6		
#200	54.6		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.502 D_{60}= 0.108 D_{50}= 0.0547

D_{30}= 0.0114 D_{15}= 0.0021 D_{10}=

C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Figure

2b2bb

Midwest Laboratories, Inc.®
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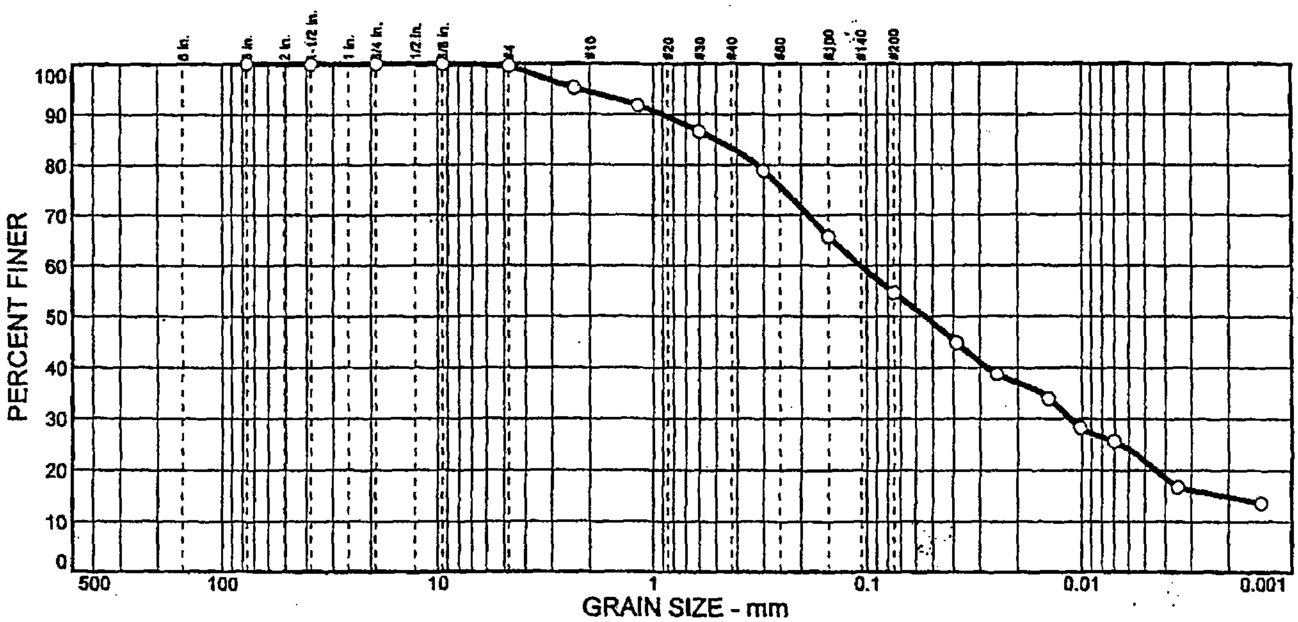
Particle Size Distribution Report

Project: BEECH GROVE **Report No.:** 07-052-2109
Client: TRIMATRIX LABORATORIES INC

Sample No: 1269163 **Source of Sample:** **Date:** 01/24/2007
Location: CSB-33-N DUP **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.4	5.2	11.1	28.7	33.0	21.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	99.6		
#8	95.2		
#16	91.8		
#30	86.6		
#50	78.8		
#100	65.6		
#200	54.6		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.502 D_{60}= 0.108 D_{50}= 0.0547
D_{30}= 0.0114 D_{15}= 0.0021 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Figure

Midwest Laboratories, Inc.
13611 "B" Street • Omaha, Nebraska 68144-3693 • (402) 334-7770 • FAX (402) 334-9121
www.midwestlabs.com

Report Number
07-052-2108

REPORT OF ANALYSIS

For: (10652) TRIMATRIX LABORATORIES INC
(616)975-4500

Mail to:

TRIMATRIX LABORATORIES INC
5560 CORPORATE EXCHANGE CT
GRAND RAPIDS MI 49512-

Date Reported: 02/21/07
Date Received: 02/16/07
Date Sampled: 01/24/07

BEECH GROVE

Lab number: 1269162 Sample ID: CSB-33-N

Analysis	Level Found	Units	Detection Limit	Method	Analyst-Date	Verified-Date

Respectfully Submitted

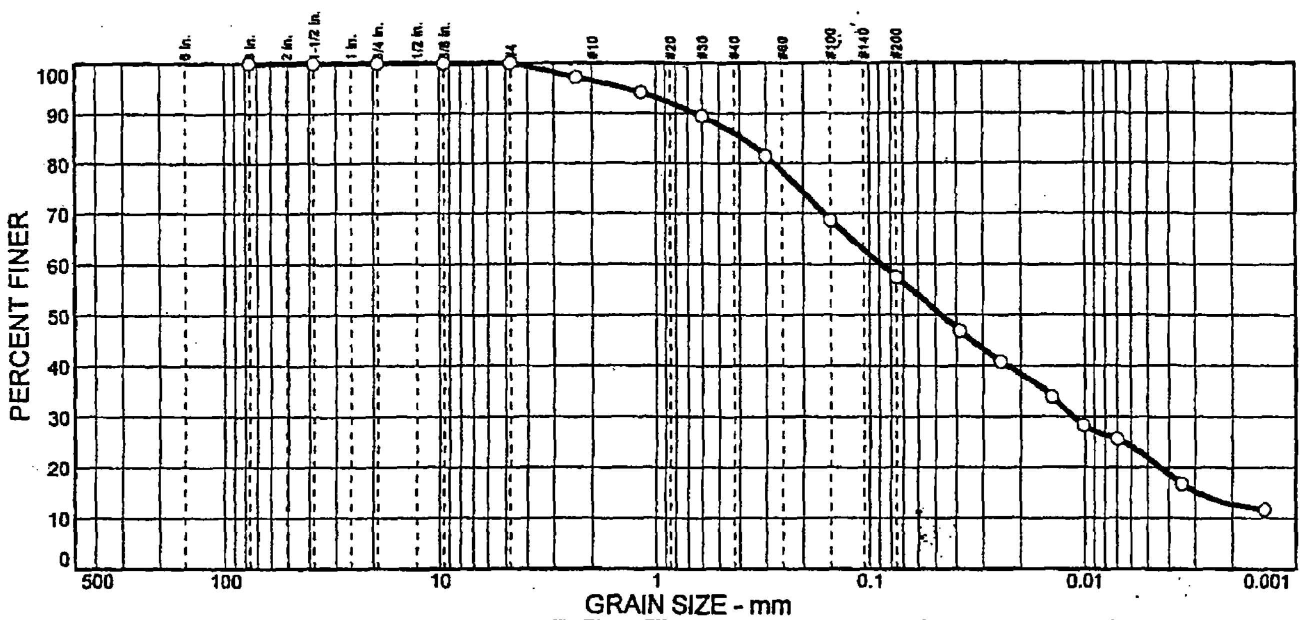
Heather Ramig/Sue Ann Seitz/Rob Ferris
Prem Arora/Client Services

Midwest Laboratories, Inc.®
13611 B Street • Omaha, Nebraska 68144-3693 • (402) 334-7770 • FAX (402) 334-9121 • www.midwestlabs.com

Particle Size Distribution Report

Project: BEECH GROVE **Report No.:** 07-052-2108
Client: TRIMATRIX LABORATORIES INC

Sample No: 1269162 **Source of Sample:** **Date:** 01/24/2007
Location: CSB-33-N **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	3.4	10.5	28.7	35.7	21.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	97.2		
#16	94.2		
#30	89.4		
#50	81.4		
#100	68.6		
#200	57.4		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.389 D_{60}= 0.0887 D_{50}= 0.0472
D_{30}= 0.0114 D_{15}= 0.0029 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Figure

Midwest Laboratories, Inc.

13611 B Street • Omaha, Nebraska 68144-3693 • (402) 334-7770 • FAX (402) 334-9121 • www.midwestlabs.com

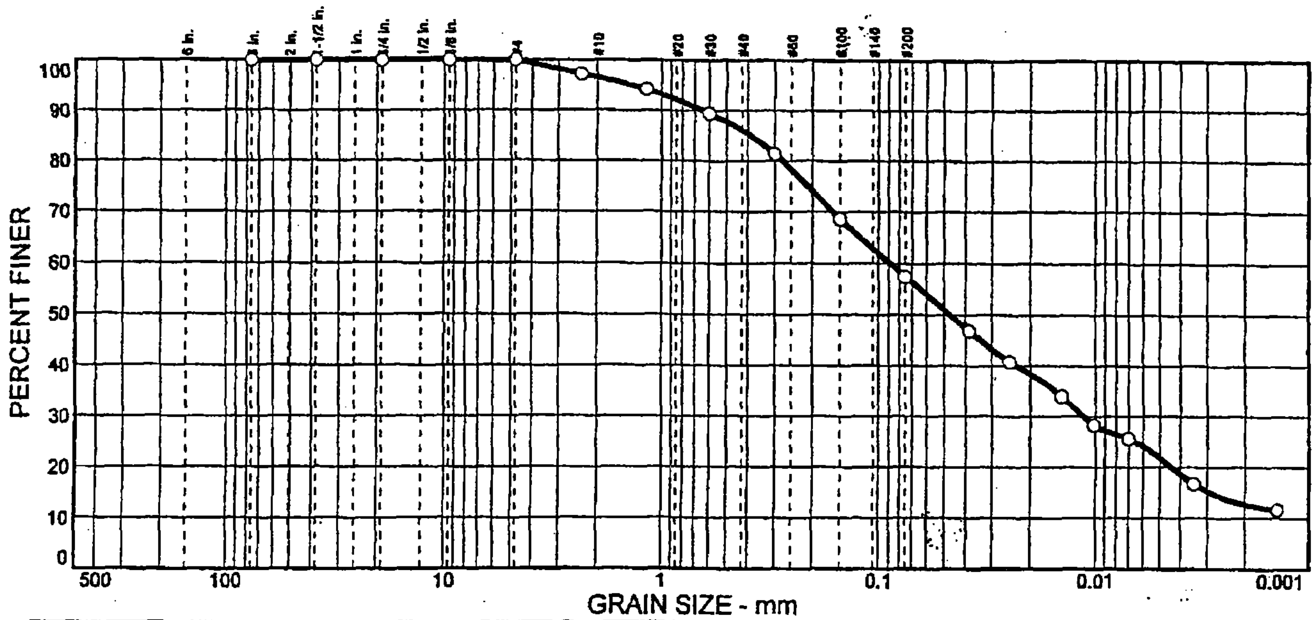
Particle Size Distribution Report

Project: BEECH GROVE **Report No.:** 07-052-2108

Client: TRIMATRIX LABORATORIES INC

Sample No: 1269162 **Source of Sample:** **Date:** 01/24/2007

Location: CSB-33-N **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	3.4	10.5	28.7	35.7	21.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	97.2		
#16	94.2		
#30	89.4		
#50	81.4		
#100	68.6		
#200	57.4		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.389 D_{60}= 0.0887 D_{50}= 0.0472

D_{30}= 0.0114 D_{15}= 0.0029 D_{10}=

C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Figure

Report Number
07-052-2112

Midwest Laboratories, Inc.
13611 "B" Street • Omaha, Nebraska 68144-3693 • (402) 334-7770 • FAX (402) 334-9121
www.midwestlabs.com

REPORT OF ANALYSIS

For: (10652) TRIMATRIX LABORATORIES INC
(616)975-4500

Mail to:

TRIMATRIX LABORATORIES INC
5560 CORPORATE EXCHANGE CT
GRAND RAPIDS MI 49512-

Date Reported: 02/21/07
Date Received: 02/16/07
Date Sampled: 01/25/07

BEECH GROVE

Lab number: 1269166 Sample ID: CSB-3-N

Analysis	Level Found	Units	Detection Limit	Method	Analyst-Date	Verified-Date

Respectfully Submitted

Heather Ramig/Sue Ann Seitz/Rob Ferris
Prem Arora/Client Services

Midwest Laboratories, Inc.

13611 B Street • Omaha, Nebraska 68144-3693 • (402) 334-7770 • FAX (402) 334-9121 • www.midwestlabs.com

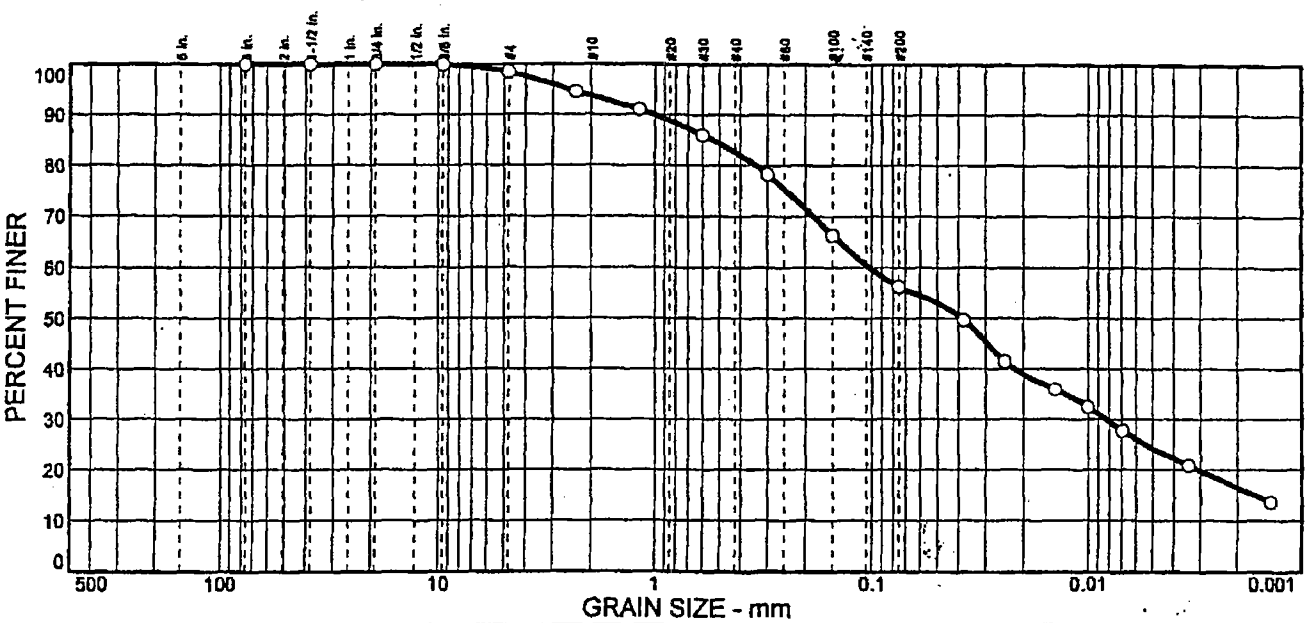
Particle Size Distribution Report

Project: BEECH GROVE **Report No.:** 07-052-2112

Client: TRIMATRIX LABORATORIES INC

Sample No: 1269166 **Source of Sample:** **Date:** 01/25/2007

Location: CSB-3-N **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.6	4.7	11.1	26.4	32.1	24.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	98.4		
#8	94.6		
#16	91.0		
#30	86.0		
#50	78.2		
#100	66.2		
#200	56.2		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.537 D_{60}= 0.103 D_{50}= 0.0387

D_{30}= 0.0083 D_{15}= 0.0017 D_{10}=

C_u= C_c=

Classification

USCS= AASHTO=

Remarks

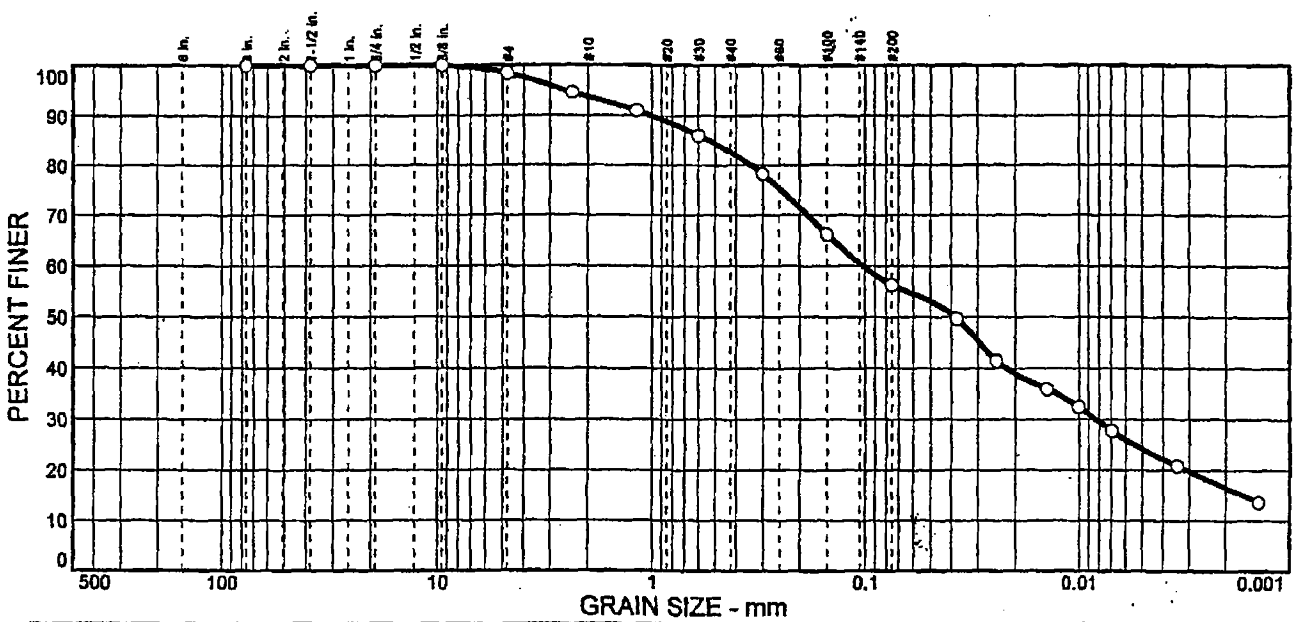
Figure

Midwest Laboratories, Inc.
13611 B Street • Omaha, Nebraska 68144-3693 • (402) 334-7770 • FAX (402) 334-9121 • www.midwestlabs.com

Particle Size Distribution Report

Project: BEECH GROVE **Report No.:** 07-052-2112
Client: TRIMATRIX LABORATORIES INC

Sample No: 1269166 **Source of Sample:** **Date:** 01/25/2007
Location: CSB-3-N **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.6	4.7	11.1	26.4	32.1	24.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	98.4		
#8	94.6		
#16	91.0		
#30	86.0		
#50	78.2		
#100	66.2		
#200	56.2		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.537 D_{60}= 0.103 D_{50}= 0.0387
D_{30}= 0.0083 D_{15}= 0.0017 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Figure

Midwest Laboratories, Inc.®
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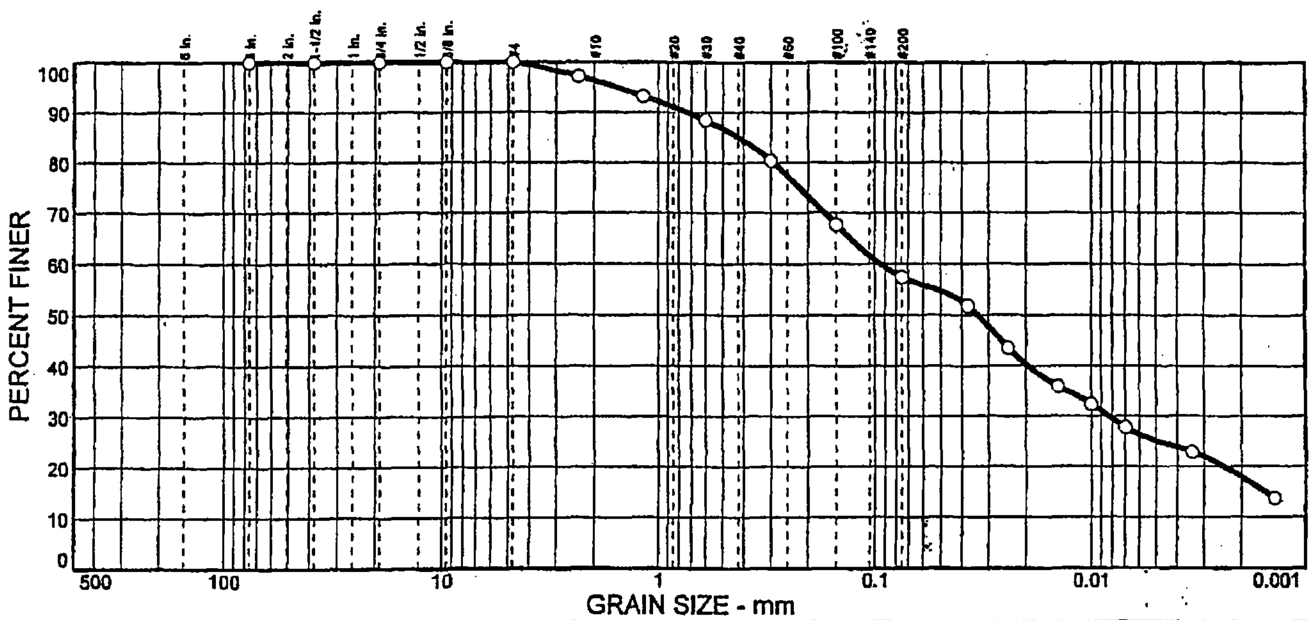
Particle Size Distribution Report

Project: BEECH GROVE **Report No.:** 07-052-2112
Client: TRIMATRIX LABORATORIES INC

Sample No: 1269166 DUP **Source of Sample:** **Date:** 01/25/2007
Location: CSB-N-N DUPLICATE **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	3.7	11.3	27.6	32.4	25.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	97.2		
#16	93.2		
#30	88.4		
#50	80.4		
#100	67.6		
#200	57.4		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.423 D_{60}= 0.0946 D_{50}= 0.0338
D_{30}= 0.0083 D_{15}= 0.0016 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Figure

Midwest Laboratories, Inc.®

13611 B Street • Omaha, Nebraska 68144-3693 • (402) 334-7770 • FAX (402) 334-9121 • www.midwestlabs.com

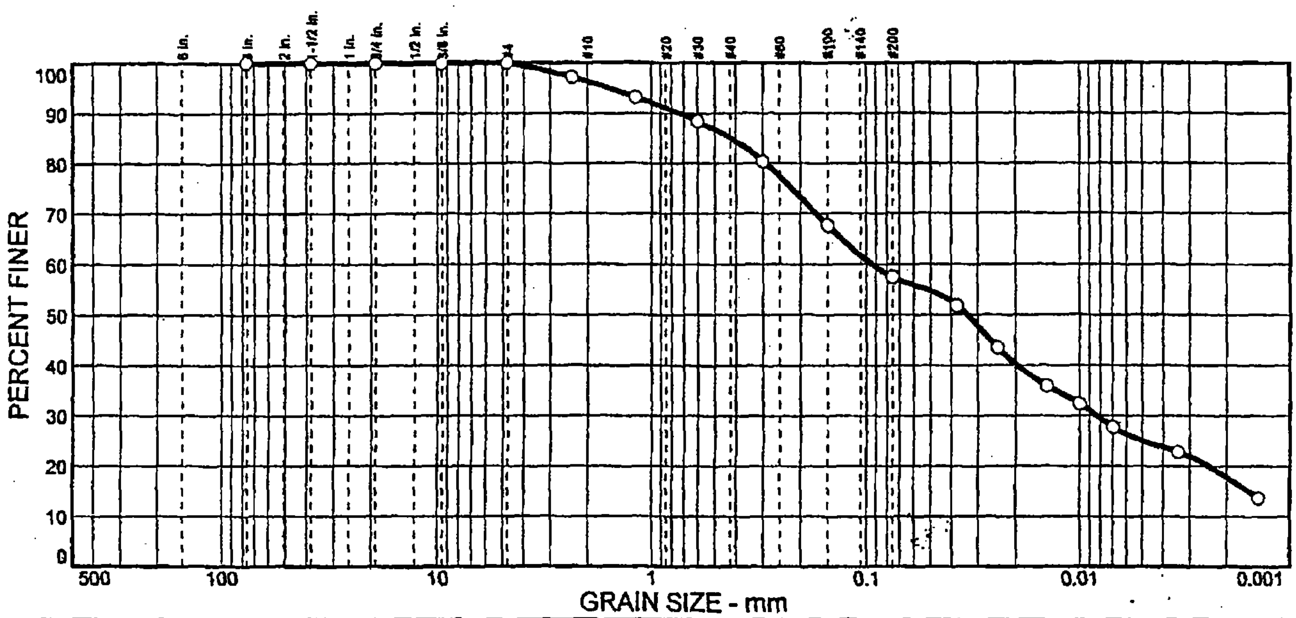
Particle Size Distribution Report

Project: BEECH GROVE **Report No.:** 07-052-2112

Client: TRIMATRIX LABORATORIES INC

Sample No: 1269166 DUP **Source of Sample:** **Date:** 01/25/2007

Location: CSB-N-N DUPLICATE **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	3.7	11.3	27.6	32.4	25.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100.0		
1.5 in.	100.0		
.75 in.	100.0		
.375 in.	100.0		
#4	100.0		
#8	97.2		
#16	93.2		
#30	88.4		
#50	80.4		
#100	67.6		
#200	57.4		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.423 D_{60}= 0.0946 D_{50}= 0.0338

D_{30}= 0.0083 D_{15}= 0.0016 D_{10}=

C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Figure

TriMatrix Laboratories, Inc.

5560 Corporate Exchange Court SE Grand Rapids, MI 49512
Phone (616) 975-4500 Fax (616) 942-7463
www.trimatrixlabs.com

Chain of Custody Record

COC No.

For Lab Use Only

Cert

VOA Rack/Tray

Receipt Log No.

Project Chemist: Jennifer Rice

Work Order No.

Client Name: TriMatrix Labs

Address: 5560 Corporate Exchange Ct, Grand Rapids, MI 49512

Phone: 616-940-4277

Fax: 616-942-7463

Project Name: Beech Grove

Client Project No. / P.O. No.

Invoice To: (●) Client ( ) Other (comments)

Contact/Report To: Jennifer Rice

Analyses Requested: A

Grain Size - Sieve Only

Container Type (corresponds to Container Packing List): 16

PRESERVATIVES
A NONE pH~7 N
B HNO_3 pH<2 S
C H_2SO_4 pH<2 S
D 1+1 HCl pH<2
E NaOH pH>12
F ZnAc/NaOH pH>9
G MeOH
H Other (note below)

Schedule	Matrix Code	Laboratory Sample Number	#	Sample ID		Cooler ID	Sample Date	Sample Time	Comp / Grab	Matrix	A (Number of Containers Submitted)	Total	Sample Comments
			1	CSB-33-N	1269162		1/24/07	11:26			1	1	
			2	CSB-33-N Dup	1269163		1/24/07	11:29			1	1	
			3	CSB-28-I	1269164		1/24/07	16:06			1	1	
			4	CSB-11-R	1269165		1/25/07	8:44			1	1	
			5	CSB-3-N	1269166		1/25/07	11:08			1	1	
			6										
			7										
			8										

RECEIVED FEB 16 2007

RECEIVED FEB 16 2007

MIDWEST LABORATORIES INT.

Sampled By (print): CP / AK

Sampler's Signature

Company

How Shipped? MIDWEST LABORATORIES INT.

Tracking No.

Comments

6.8

1. Relinquished By	Date	Time	2. Relinquished By	Date	Time	3. Relinquished By	Date	Time
							2-15-07	
1. Received By	Date	Time	2. Received By	Date	Time	3. Received For Lab By	Date	Time

CHAIN OF CUSTODY

CHAIN OF CUSTODY

RMC Beechgrove
1/2007 GW Sampling
Trimatrix #0701310, Project #2003-1046

Sample Location		MW-9			EB-1-012207		
Lab ID		0701310-01			0701310-02		
Sample Date		1/22/2007			1/22/2007		
Matrix		Groundwater			Aqueous		
Remarks					Equipment Blank		
Parameter	**Units**	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**
Total Metals							
Antimony	ug/L		U	1		U	1
Arsenic	ug/L	1.6		1		U	1
Calcium	ug/L	160000		500	71	J	500
Iron	ug/L	270		10	10	U	10
Lead	ug/L	0.43	J	1		U	1
Magnesium	ug/L	50000		500		U	500
Manganese	ug/L	37		10		U	10
Sodium	ug/L	14000		500		U	500
Dissolved Metals							
Antimony	ug/L		U	1		U	1
Arsenic	ug/L	1		1		U	1
Calcium	ug/L	160000		500	94	J	500
Iron	ug/L	4.5	J	10		U	10
Lead	ug/L		U	1	0.24	J	1
Magnesium	ug/L	49000		500		U	500
Manganese	ug/L	7.7	J	10		U	10
Sodium	ug/L	15000		500	370	J	500
Conventionals							
Alkalinity, Bicarbonate	mg/L	250		2		U	2
Alkalinity, Carbonate	mg/L		U	2		U	2
Carbon, Total Organic	mg/L	1.3		1	0.23	J	1
Chloride	mg/L	63		1		U	1
Nitrogen, Nitrate	mg/L	0.047	J	0.05	0.008	J	0.05
Nitrogen, Nitrite	mg/L		U	0.05	0.0015	J	0.05
pH	pH Units	7	R	1	5.8	R	1
Phenolics, Total	mg/L		U	0.05		U	0.05
Sulfate	mg/L	290		10	1	U	1
Sulfide	mg/L		U	1		U	1
Sulfite	mg/L		UJ	1		UJ	1
Total Organic Halides (TOX)	ug/L as Cl	2.5	J	10		U	10

\\Gaea\sys\OFICEAGC\COMMON\QA\RMC Beech Grove\DataVal\2007 Sampling\0701310 Table

QA Scientist Erica Nicholson Date 3.13.07

RMC Beechgrove
1/2007 GW Sampling
Trimatrix #0701324, Project #2003-1046

Sample Location		MW-12			MW-1			MW-6D			MW-10			EB-3-012307			MW-6D-D		
Lab ID		0701324-01			0701324-02			0701324-03			0701324-04			0701324-05			0701324-06		
Sample Date		1/23/2007			1/23/2007			1/23/2007			1/23/2007			1/23/2007			1/23/2007		
Matrix		Groundwater			Groundwater			Groundwater			Groundwater			Aqueous			Groundwater		
Remarks														Equipment Blank			FD of MW-6D		
Parameter	**Units**	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**
Total Metals																			
Antimony	ug/L		U	1		U	1		U	1		U	1		U	1		U	1
Arsenic	ug/L	1.1		1	24		1	22		1	22		1		U	1	22		1
Calcium	ug/L	90000		500	280000		500	76000		500	270000		500	73	J	500	78000		500
Iron	ug/L	410		10	5600		10	380		10	17000		10	10	U	10	420		10
Lead	ug/L	1.1	U	1	2.5	U	1	1.7	U	1	2.1	U	1	0.84	J	1	1	U	1
Magnesium	ug/L	27000		500	120000		500	35000		500	610000		12000	43	J	500	36000		500
Manganese	ug/L	67		10	160		10	14		10	340		10		U	10	13		10
Sodium	ug/L	8300		500	17000		500	23000		500	1000000		12000	180	J	500	23000		500
Dissolved Metals																			
Antimony	ug/L		U	1		U	1		U	1		U	1		U	1		U	1
Arsenic	ug/L		U	1	11		1	19		1	5.8		1		U	1	19		1
Calcium	ug/L	93000		500	280000		500	79000		500	360000		500	170	J	500	80000		500
Iron	ug/L	55		10	3000		10	270		10	11000		10	8	J	10	280		10
Lead	ug/L		U	1		U	1		U	1		U	1		U	1		U	1
Magnesium	ug/L	28000		500	120000		500	37000		500	590000		12000	63	J	500	37000		500
Manganese	ug/L	73		10	180		10	14		10	340		10		U	10	12		10
Sodium	ug/L	9000		500	17000		500	24000		500	1000000		12000	690		500	24000		500
Conventionals																			
Alkalinity, Bicarbonate	mg/L	360		2	330		2	350		2	520		2		U	2	350		2
Alkalinity, Carbonate	mg/L		U	2		U	2		U	2		U	2		U	2		U	2
Carbon, Total Organic	mg/L	1.8		1	2		1	2.2		1	4.9		1		U	1	2.2		1
Chloride	mg/L	2.4		1	470		10	47		1	120		2		U	1	45		1
Nitrogen, Nitrate	mg/L	0.05	U	0.05	0.08		0.05	0.77		0.05	0.05	U	0.05	0.013	J	0.05	0.72		0.05
Nitrogen, Nitrite	mg/L		U	0.05		U	0.05	0.05	U	0.05	0.05	U	0.05		U	0.05	0.05	U	0.05
pH	pH Units	6.7	J	1	6.6	J	1	7.2	J	1	6.7	J	1	5.5	J	1	7.1	J	1
Phenolics, Total	mg/L		U	0.05		NA			NA			NA			U	0.05		NA	
Sulfate	mg/L	20		1	290		10	34		2	4900		200	1	U	1	34		1
Sulfide	mg/L		U	1		U	1		NA			U	1		U	1		U	1
Sulfite	mg/L		UJ	1		UJ	1		UJ	1		UJ	1		UJ	1		UJ	1
Total Organic Halides (TOX)	ug/L as Cl	3	J	10		NA			NA			NA			U	10		NA	

NOTE: Sulfide bottle for MW-6 broke during shipping. MW-6 was NOT re-sampled for Sulfide.

QA Scientist Erica Nicholson Date 3.13.07

RMC Beechgrove
1/2007 GW Sampling
Trimatrix #0701343, Project #2003-1046

Sample Location		MW-2			MW-3			MW-8S			MW-5			MW-5-D			MW-6SR			EB-5-012407		
Lab ID		0701343-01			0701343-02			0701343-03			0701343-04			0701343-05			0701343-06			0701343-07		
Sample Date		1/24/2007			1/24/2007			1/24/2007			1/24/2007			1/24/2007			1/24/2007			1/24/2007		
Matrix		Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			Aqueous		
Remarks														FD of MW-5						Equipment Blank		
Parameter	**Units**	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**
Total Metals																						
Antimony	ug/L	5.2	U	1		U	1	5.7		1		U	1		U	1		U	1	1.1		1
Arsenic	ug/L	24		1	170		1	3.2		1	4.3		1	4.2		1	1.9		1		U	1
Calcium	ug/L	330000		500	180000		500	140000		500	110000		500	110000		500	84000		500	65	J	500
Iron	ug/L	9000		10	30000		10	190		10	1000		10	950		10	2600		50	10	U	10
Lead	ug/L	75		1	3.9		1	21		1	4.3		1	3.8		1	2.1		1		U	1
Magnesium	ug/L	120000		500	67000		500	66000		500	38000		500	37000		500	31000		500		U	500
Manganese	ug/L	190		10	120		10	95		10	230		10	260		10	99		10		U	10
Sodium	ug/L	52000		500	38000		500	38000		500	29000		500	28000		500	35000		500	95	J	500
Dissolved Metals																						
Antimony	ug/L	1.4		1		U	1	5		1		U	1		U	1		U	1		U	1
Arsenic	ug/L	5.2		1	5		1	2		1	2.3		1	2.7		1	0.88	J	1		U	1
Calcium	ug/L	320000		500	190000		500	140000		500	110000		500	110000		500	76000		500	52	J	500
Iron	ug/L	4800		10	1900		10	40		10	540		10	570		10	670		10		U	10
Lead	ug/L	1.2		1	0.31	J	1	2.1		1		U	1	0.26	J	1		U	1		U	1
Magnesium	ug/L	120000		500	70000		500	68000		500	38000		500	38000		500	28000		500		U	500
Manganese	ug/L	190		10	120		10	27		10	210		10	200		10	85		10		U	10
Sodium	ug/L	53000		500	40000		500	39000		500	29000		500	28000		500	37000		500	60	J	500
Conventionals																						
Alkalinity, Bicarbonate	mg/L	360		2	290		2	390		2	290		2	290		2	400		2		U	2
Alkalinity, Carbonate	mg/L		U	2		U	2		U	2		U	2		U	2		U	2		U	2
Carbon, Total Organic	mg/L	2.2	J	1	2.1	J	1	1.5	U	1	1.7	J	1	1.6	J	1	1.7	J	1	1	U	1
Chloride	mg/L	100		2	250		5	170		2	100		2	110		2	18		1	1	U	1
Nitrogen, Nitrate	mg/L	0.03	J	0.05	0.026	J	0.05	0.27		0.05	0.024	J	0.1	0.021	J	0.1	0.048	J	0.1	0.05	U	0.05
Nitrogen, Nitrite	mg/L		U	0.05	0.0079	J	0.05		U	0.05		U	0.1		U	0.1		U	0.1		U	0.05
pH	pH Units	6.7	J	1	6.5	J	1	6.8	J	1	7.2	J	1	7	J	1	6.9	J	1	5.7	J	1
Phenolics, Total	mg/L		NA			NA			NA			U	0.1		U	0.1		U	0.1		U	0.05
Sulfate	mg/L	750		40	170		5	110		5	52		2	53		2	84		5	1	U	1
Sulfide	mg/L		NA			U	1		U	1		U	1		U	1		U	1		U	1
Sulfite	mg/L		UJ	1		UJ	1		UJ	1		UJ	1		UJ	1		UJ	1		UJ	1
Total Organic Halides (TOX)	ug/L as Cl		NA			NA			NA		39		10	31		10	25		10	10	U	10

NOTE: Sulfide bottle for MW-2 broke during shipping. MW-2 was re-sampled for Sulfide on 1/25/2007, results found in package 0701366.

\\Gaea\sys\OFICEAGC\COMMON\QA\RMC Beech Grove\DataVal\2007 Sampling\0701343 Table

QA Scientist Erica Nicholson Date 3.13.07

RMC Beechgrove
1/2007 GW Sampling
Trimatrix #0701366, Project #2003-1046

Sample Location		MW-4			MW-2D			MW-11			MW-7S			MW-2			EB-7-012507		
Lab ID		0701366-01			0701366-02			0701366-03			0701366-04			0701366-05			0701366-06		
Sample Date		1/25/2007			1/25/2007			1/25/2007			1/25/2007			1/25/2007			1/25/2007		
Matrix		Groundwater			Groundwater			Groundwater			Groundwater			Groundwater			Aqueous		
Remarks																	Equipment Blank		
Parameter	**Units**	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**	**Result**	**Q**	**RL**
Total Metals																			
Antimony	ug/L		U	1		U	1	1.2		1	2.9		1		NA			U	1
Arsenic	ug/L	0.56	J	1	19		1	4.3		1	190		1		NA			U	1
Calcium	ug/L	110000		500	72000		500	170000		500	470000		500		NA		78	J	500
Iron	ug/L	2300		10	2800		10	960		10	30000		10		NA		10	U	10
Lead	ug/L	3.9		1	4.1		1	2.8		1	94		1		NA		0.53	J	1
Magnesium	ug/L	34000		500	28000		500	64000		500	290000		5000		NA			U	500
Manganese	ug/L	70		10	28		10	260		10	250		10		NA		1.6	J	10
Sodium	ug/L	27000		500	25000		500	66000		500	310000		5000		NA		130	J	500
Dissolved Metals																			
Antimony	ug/L		U	1		U	1		U	1		U	1		NA			U	1
Arsenic	ug/L	0.59	J	1	17		1	0.52	J	1	5.9		1		NA			U	1
Calcium	ug/L	110000		500	74000		500	170000		500	480000		500		NA		71	J	500
Iron	ug/L	120		10	2800		10	28	U	10	4100		10		NA		7.4	J	10
Lead	ug/L	0.24	J	1		U	1	0.99	J	1		U	1		NA			U	1
Magnesium	ug/L	35000		500	29000		500	67000		500	280000		5000		NA			U	500
Manganese	ug/L	60		10	28		10	210		10	220		10		NA			U	10
Sodium	ug/L	28000		500	27000		500	71000		500	300000		5000		NA		110	J	500
Conventionals																			
Alkalinity, Bicarbonate	mg/L	380		2	370		2	330		2	480		2		NA			U	2
Alkalinity, Carbonate	mg/L		U	2		U	2		U	2		U	2		NA			U	2
Carbon, Total Organic	mg/L	2.1	J	1	3.9	J	1	1.4	J	1	3.3	J	1		NA			U	1
Chloride	mg/L	17		1	9.9		1	320		5	250		5		NA			U	1
Nitrogen, Nitrate	mg/L	0.079		0.05	0.05	U	0.05	0.072		0.05	0.034	J	0.05		NA		0.05	U	0.05
Nitrogen, Nitrite	mg/L		U	0.05		U	0.05		U	0.05	0.0099	J	0.05		NA			U	0.05
pH	pH Units	6.7	R	1	6.9	R	1	6.7	R	1	6.6	R	1		NA		7	R	1
Sulfate	mg/L	60		2		UJ	1	83		5	1900		100		NA		1	U	1
Sulfide	mg/L		U	1		U	1		U	1		U	1		U	1		U	1
Sulfite	mg/L		UJ	1		UJ	1		UJ	1		UJ	1		NA			UJ	1

NOTE: Sulfide bottle for MW-2 sampled on 1/24/2007 broke during shipping. MW-2 was re-sampled for Sulfide and results shown on this table.

\\G[illegible]s\OFICEAGC\COMMON\QA\RMC Beech Grove\DataVal\2007 Sampling\0701366 Table

QA Scientist Erica Nicholson Date 3.13.07

APPENDIX C

Lead and Arsenic Retardation Calculations

ADVANCED GEOSERVICES CORP.

"Engineering for the Environment"™

CALCULATION OF K_d FOR As AND Pb

	TOTAL (mg/kg)	SPLP (mg/L)	K_D (L/Kg)
CSB-28E			
As:	13.0	0.0023	5,652
Pb:	15.0u	0.0079	1,899
CSB-33 F			
As:	7.3	0.0034	2,147
Pb:	18.0u	0.0048	3.750
CSB-11 F			
As:	6.8	0.0012u	5,667
Pb:	43.0	0.0026	16,538
CSB-3 G			
As:	4.4	0.002	2.200
Pb:	65.0u	0.012	5,416

As: Mean = $\frac{15,666}{4}$ = 3,917 L/kg

Pb: Mean = $\frac{27,603}{4}$ = 6,901 L/kg

K_d: REPRESENTS THE RELATIVE VELOCITY OF AQUEOUS PHASE TO CONTAMINANT BY DETERMINING R_F.

SHEET 1 OF 2 PROJECT NO. ______ PROJECT NAME Green Grove
BY PGS DATE 8-3-07 DESCRIPTION K_d Calculations
CHK. BY ______ DATE ______

ADVANCED GEOSERVICES CORP.

"Engineering for the Environment"™

RETARDATION EQUATION:

$$R_f = 1 + \frac{\rho Kd}{n}$$

ρ = Bulk Density use 1.5 Kg/L

n = Effective Porosity use 0.3

FOR As:

$$R_f = 1 + \frac{(1.5)(3917)}{0.3}$$

$$R_f = 19,585$$

FOR Pb:

$$R_f = 1 + \frac{(1.5)(6901)}{0.3}$$

$$R_f = 34,506$$

Hydraulic Conductivity for Silt and Clay in Marion County too low for reporting purposes (Meyer 1975). Hydraulic Conductivity for sand is 40 ft/day (Meyer 1975).

USING 40 ft/DAY (WHICH IS CONSIDERED VERY CONSERVATIVE FOR THE POORLY DEFINED SILTY SAND AND SANDY CLAY)

$$V = (365\ \text{day/yr})(40\ \text{ft/day}) = 14,600\ \text{ft/yr}$$

DISTANCE TRAVELED IN 40 YEAR OPERATING LIFE OF FACILITY

$$As = \frac{(40)(14600)}{19,585} = 30'$$

$$Pb = \frac{(40)(14,600)}{34,506} = 17'$$

SHEET 2 OF 2	PROJECT NO.	PROJECT NAME	BEECH GROVE
BY PCS	DATE 8-3-07	DESCRIPTION	RETARDATION CALC.
CHK. BY	DATE		